Original instructions

AVANTI SERVICE LIFT

User's, Installation and Maintenance Manual

Model Service Lift PEGASUS

CE certificate of Pegasus CE versions:

CERTIFICATE

EC Directive 2006/42/EC, Article 12, Paragraph 3b
Machinery

Certificate Registration No.: 01/205/0823/14 B

Certification body for machinery NB 0035
of TÜV Rheinland Industrie Service GmbH
hereby certifies the company

AVANTI WIND SYSTEMS, S.L.

Pol. Ind. Centrovía – c/ Los Ángeles, nº88
E-50196 La Muela, Zaragoza
España

Conformity of the product

Vertical Platform Service Lift
Inside Wind Turbine Systems

Type: PEGASUS-250 kg

Modification: additional basket "tool kit"

Technical data:

Ident. No: 20LP0001
Type of drive: Electric / Pinion-Rack
Max. Lifting height: 150 m
Max. load capacity: 250 kg / 2 People
Max. Lifting speed: 0,33 m/s

with the requirements defined in Annex I to Directive 2006/42/EC on machinery and amending Directive 95/16/EC of the European Parliament and the Council in May 2006 on the approximation of laws, regulations and administrative Member States relating to machinery.
Proof has been furnished on the basis of an EC Type Examination, Report No.: AE.COL.00022-12 from 03.02.2014, and is valid subject to compliance with the requirements stated in this document.
This certificate is valid until 17.09.2018

TÜVRheinland 0035 Notified Body

Berlin, 28.02.2014

Certification body
Notified under No. 0035
Head / Certifier

Dipl.-Ing. Eberhard Frejno

TÜV Rheinland Industrie Service GmbH
Alboinstraße 56, 12103 Berlin
Telefon +49 (0)30 75 62 – 1557, Fax +49 (0)30 75 62 – 13 70

TÜVRheinland®
Genau. Richtig.

AECO certificate of Pegasus AECO version:

LIFTINSTITUUT

CERTIFICATE OF CONFORMANCE

Acting under ASME A17.7.1/CSA B44.7.1 issued by Liftinstituut B.V.
identification number ANSI AECO #0842
(AECO = Accredited Elevator/Escalator Certification Organization)
Certification system 3 according to ISO Guide 67: 2004

Certificate no.	:	NA14-0842-1004-018-01	Revision no.: 1
Description of the product	:	Wind Turbine Elevator	
Type	:	Pegasus L	
Model no.	:	-	
Name and address of the manufacturer	:	Avanti Wind Systems SL Polígono Industrial Centrovia Calle Los Angeles n°88 Nave 1 50198 La Muela (Zaragoza) Spain	
Name and address of the certificate holder	:	Avanti Wind Systems A/S Rønnevangs Allé 6 DK-3400 Hillerød Denmark	
Certificate issued on the basis of the following requirements	:	ASME A17.7-2007 / CSA B44.7-07 (I-4 Elevator Systems)	
Test laboratory/location	:	Avanti Wind Systems SL	
Date and number of the laboratory report	:	None	
Date of verification of conformance	:	June 2013 – September 2014	
Annexes with this certificate	:	Certificate of Conformance Report no: NA14-0842-1004-018-01 Rev. 1	
Additional remarks	:	For GESRs, SPs and other information see supporting report.	
Conclusion	:	The Elevator System meets the requirements of the ASME A17.7-2007 / CSA B44.7-07, taking into account any additional remarks mentioned above.	

Issued in Amsterdam

Date of issue : 27-10-2014

Valid thru : 27-10-2017

ing. A.J. van Ommen
Manager Business Unit
Certification

Certification decision by

Date of publication:
4th CE Edition: 10/2014
Revision 2: 11/11/14

Manufacturer:

Avanti Wind Systems SL
Poligono Industrial Centrovia
Calle Los Angeles n°88 Nave 1
50198 La Muela (Zaragoza)
Spain
P: (+34) 976 149 524
F: (+34) 976 149 508
E: info@avanti-online.com
I: www.avanti-online.com

Avanti Wind Systems, Inc.
5150 Towne Drive
New Berlin
Wisconsin 53151
USA
P: (+1) 262 641 9101
F: (+1) 262 641 9161

Avanti Wind Systems
Building 4, No, 518,
Gangde Road, XiaokunshanTown
Songjiang District, 201614 Shanghai
China
P: (+86) 21 5785 8811
F: (+86) 21 5785 8815

Sales & Service:

Australia	Avanti Wind Systems PTY LTD	P: +61 (0) 7 3902 1445
China	Avanti Wind Systems	P: +86 21 5785 8811
Denmark	Avanti Wind Systems A/S	P: +45 4824 9024
Germany	Avanti Wind Systems GmbH	P: +49 (0) 41 21-7 88 85 – 0
Spain	Avanti Wind Systems SL	P: +34 976 149 524
UK	Avanti Wind Systems Limited	P: +44 0 1706 356 442
USA	Avanti Wind Systems, Inc	P: +1 (262) 641-9101
India	Avanti Wind Systems, PL	P: +91 44 6455 5911
Brazil	Avanti Brazil Sistemas Eólicos. S.L.	P: +55 85 9671 6336

Manufactured Under Process Patent NO.8,499,896.
® Registered in Europe

Contents

Page

1 Limited Warranty . . . 7

2 Introduction . . . 8
2.1 Observations . . . 8
2.2 Symbols . . . 8
2.3 Cautions . . . 9

3 Description . . . 10
3.1 Purpose . . . 10
3.2 Scope . . . 10
3.3 Exclusions . . . 10
3.4 Technical specifications . . . 11
3.5 Service lift overview . . . 12
3.6 General arrangement of Pegasus lift inside a generic wind turbine tower . . . 14
3.7 Service lift dimensions . . . 15
3.8 Main frame . . . 17
3.9 Controls . . . 18
3.9.1 Bottom platform control box . . . 18
3.9.2 Cabin control box . . . 19
3.9.3 Top platform control box . . . 20
3.9.4 Mid tower junction box . . . 20
3.10 Service lift doors . . . 21
3.11 Top hatch . . . 22
3.12 Bottom hatch . . . 23
3.13 Top safety stop . . . 23
3.14 Bottom safety stop . . . 23
3.15. Top obstruction device . . . 24
3.15.1. Frame configuration . . . 24
3.15.2. Roof configuration . . . 24
3.16. Bottom obstruction device . . . 24
3.16.1. Without bottom limit switch configuration . . . 24
3.16.2. With bottom limit switch configuration . . . 24
3.17. Emergency top and bottom limit switch . . . 24
3.18. Top and bottom mechanical stops . . . 24
3.19. Traction system . . . 25
3.20. Guiding and anti-derailment system . . . 25
3.21. Overload limiter . . . 25
3.22. Manual descent system . . . 25
3.23. Rest platforms . . . 25
3.24. Anchor points for PPE . . . 26
3.25. Information signs and documents . . . 26
3.26. Internal light . . . 26
3.27. Warning lights . . . 26
3.28. Platform fences . . . 26
3.29. Differential controller . . . 26

4 Lift Operation . . . 27
4.1 Cautions . . . 27
4.2 Prohibited uses . . . 27
4.3 Operation from inside the cabin . . . 27
4.4 Operation from bottom platform . . . 27
4.5 Operation from top platform . . . 27
4.6 Landing alignment . . . 27
4.7 Enter and exit cabin . . . 27
4.8 Lateral windows . . . 28
4.9 Emergency stop button . . . 28
4.10 Manual operation . . . 28
4.11 Rest platforms . . . 28
4.12 Service ladder . . . 28

5 Out Of Service 29

6 Maintenance 30
6.1 Maintenance planning 30
6.2 Cautions 30
6.3 Daily Inspection 30
6.4 Anual inspection 31
6.4.1 Pinions 31
6.4.2 Ladder rack 31
6.4.3 Guiding rollers 32
6.4.4 Anti-dearilment brackets 33
6.4.5 Torques assurance 33
6.4.6 Overload, static and dynamic tests 34
6.4.7 Motor group 34
6.4.7.1 Gear box 34
6.4.7.2 Centrifugal brake 34
6.4.7.3 Motor brake 34
6.5 Ordering spare parts 34

7 Troubleshooting 35

8 Transport 36
8.1 Cabin 36
8.2 Installation accessories 36
8.3 Mast sections 36

9 Delivery inspection 36

10 Storage 37
10.1 Before installation of service lift on WTG tower section 37
10.2 After installation of service lift on WTG tower section 37
10.3 During WTG tower erection 37
10.4 After service lift is put into service 37

11 Installation 37
11.1 WTG requirements 37
11.2 Caution on site 38
11.3 Assembly in tower factory 39
11.3.1 Top tower section 39
11.3.2 Intermediate tower sections 39
11.3.3 Bottom tower section 39
11.4 Assembly on site 40
11.5 Electric adjustment on site 41
11.6 Alignment labels installation 41

12 Disassembling 41

13 Inspection before first use 42

Appendix A: Adjustment of the overload limiter 43
Appendix B: Inspection checklist 44
Appendix C: Inspection log sheet 47
Appendix D: AVANTI service lift anchor point 48
Appendix E: Service tool kit 52
Appendix F: Test and adjustment of the electromagnetic breaks 57

1. Limited Warranty

AVANTI Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of 365 days thereafter, or the period set forth in the standard AVANTI warranty, the Product[1)] described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of AVANTI under this limited warranty, shall be, at the option of AVANTI, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to AVANTI, freight and insurance prepaid. The obligations of AVANTI are expressly conditioned upon return of the Product in strict accordance with the return procedures of AVANTI.

This warranty does not apply if the Product (i) has been altered without the authorization of AVANTI or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from AVANTI; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by AVANTI to Customer without charge; or (v) has been sold on an “AS-IS” basis.

Except as specifically set forth in this Limited Warranty,

ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.

This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall be taken as authoritative.

* Avanti service lift (“Product”)

2. Introduction

2.1 Observations

Only trained people may use this lift.

This manual must be available to staff at all times during installation, maintenance and operation.
Additional copies are available from the manufacturer upon request.
All measurements are indicative only and subject to change without notice.

The pictures and sketches in this manual may not reflect the product aesthetics, colours, arrangement precisely. This has no impact on the function or safety.

2.2 Symbols

Safety instructions

Symbol	Signal word	Meaning	Possible injury if not observed
	DANGER!	IMMEDIATE or possibly imminent danger:	Death or severe injury!
	DANGER!	IMMEDIATE or possibly imminent danger of hazardous voltage:	Death or severe injury!
	CAUTION!	Potentially hazardous situation:	Light injury or material damage.

Additional instructions

	ATTENTION!	Potentially dangerous situation:	Damage to equipment or workplace
	IMPORTANT!	Useful tips for optimum working procedure	None
	VERSION!	Differentiation between CE versions and AECO version.	
		Reference to written specification/documentation	

2.3 Cautions

Use and daily inspection of the service lift shall only be performed by AVANTI or personnel authorised by AVANTI, hired by the employer for the job at hand.
Installation and maintenance of the service lift shall only be performed by AVANTI or qualified personnel authorised by AVANTI, hired by the employer for the job at hand. Additionally, these tasks may be performed by qualified personnel authorised by a trainer authorised by AVANTI.

The personnel must be at least 18 years of age.
The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard, gloves, safety shoes and a slider compatible with the safety line of the ladder) at all times.

A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

If more than one person is entrusted with one of the above tasks, the employer shall appoint a supervisor in charge of the operation.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!

If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

All tests/repairs of electrical installations may only be performed by AVANTI or qualified personnel authorised by AVANTI.

All repairs to the traction, braking and supporting systems may only be performed by AVANTI or qualified personnel authorised by AVANTI.

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by AVANTI or qualified personnel authorised by AVANTI.

Only original fault-free parts may be used.
Use of non-original parts will render the AVANTI's warranty void and any type approval invalid.
No modification, extension or reconstruction of the service lift is allowed without the AVANTI's prior written consent.

No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by AVANTI.

Before using the lift perform an inspection by AVANTI or qualified personnel authorised by AVANTI.

Service lift must be inspected at least once a year by AVANTI or qualified personnel authorised by AVANTI. In case of high operating frequency or severe conditions of use, more frequent inspection is required.

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/year (250 h in total).

Service lift may not be used by persons who are under the influence of alcohol or drugs which may jeopardize working safety.

Service lift shall ONLY be used when the turbine is not generating power.

All wind farm site specific rules must be followed.
Service lift shall not be used during inclement weather, including wind speeds over 18 m/s.

Personnel shall be equipped with a wired or wireless two way communication device, that shall be connected to a location staffed by authorised personnel [1]. Personnel shall be equipped with portable lights of minimum 200 lx [1] (i.e. flashlights or headlamps).

Avoid injury – follow all instructions!

The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.

[1] Optional for CE versions. Mandatory for AECO version.

3. Description

3.1 Purpose

The service lift purpose is to transport persons plus their tools and equipment to the most convenient height for performing work in wind turbine generators (WTG).

Its use is limited to personnel authorised by AVANTI holding the relevant training certificates.
The access to the WTG and consequently to the service lift is controlled and forbidden to public access.
The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point).
It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

3.2 Scope

This manual contains instructions for three different versions of the Pegasus lift:

- *Pegasus CE bucket type version and Pegasus CE full sliding door version, which are certified to Machinery Directive 2006/42/EC.*

- *Pegasus AECO version, which is certified to ASME A17.7/CSA B44.7-2007.*

The scope of the certificate is:
- a rack and pinion service lift,
- a ladder (mast),
- the necessary accessories to allow the connection to the WTG and the control and safety functions described in the manual. The accessories include: ladder supports (ties to the tower brackets), rest platforms, mechanical stops, safe zone plates, platform control boxes and other electrical equipment. It also includes the hardware necessary to make the connections, stickers and warning signs.
- and the platform fences.

The ladder sections, their supports, related accessories and platform fences may be assembled to the tower in the WTG factory and supplied later on site for final installation.
The service lift is supplied pre-assembled and may be supplied to the WTG factory or on site directly. Final assembly, adjustment, installation and verification of the service lift shall be made on site.

3.3 Exclusions

A declaration of conformity of the complete system integrated in the WTG can only be issued after the system has been fully incorporated. In case the necessary information for the evaluation is not supplied to AVANTI, a declaration of incorporation shall be issued.

In such case, equipment with missing information shall be specifically out of the scope of the certificate, but will be needed for the safe integration and use of the service lift. The WTG manufacturer will be responsible for ensuring full compliance of the system once integrated in the tower. To do so, the instructions and WTG requirements stated in this manual shall be observed.

For example, the emergency lighting along the WTG shall be considered, in order to guarantee a safe evacuation from WTG in case of emergency.

The WTG manufacturer's risk assessment shall include a service lift integration study.

The service lift must not be used outdoor or in potentially explosive atmospheres.

3.4 Technical specifications

Service lift		CE versions	AECO version
Cabin type		Bucket type [2], front fence (1.1 m) with double door Full sliding door	Full sliding door
Service lift speed		19.4 m/min ± 10 % (50 Hz) 17.4 m/min ± 10 % (60 Hz)	17.4 m/min ± 10 % (60 Hz)
Working load limit / N° persons (max)		250 Kg / 2 Persons	250 Kg / 2 Persons
Travelling height		150 m	150 m
Operating temperature[1]	Standard	-10°C to +60°C	-10°C to +60°C
	Low	-25°C to +40°C	-25°C to +40°C
Survival temperature [1]	Standard	-25°C to +80°C	-25°C to +80°C
	Low	-40°C to +80°C	-40°C to +80°C
Traction system type		Rack and pinion	Rack and pinion
Max.noise level		80 dB (A)	80 dB (A)
Power supply		3 kW, 16 A 3 Phase 400V, 50Hz / 60Hz	3 kW, 16 A 3 Phase 400V, 60Hz
IP protection / NEMA type [1]		min. IP 54	Type 4
Control voltage		24 VAC	24 VAC

[1]*Note: for special working conditions, check with the manufacturer*

Traction system	CE versions	AECO version
Power	2 x 1.5 kW	2 x 1.5 kW
Gear box ratio	1 : 15 (50 Hz)- 1 : 20 (60 Hz)	1 : 20 (60 Hz)
Rack / Pinion module	6	6
Centrifugal brake limiting speed	24 m/min	24 m/min
Dimensions	220 x 225 x 580 mm	220 x 225 x 580 mm
Weight by motor group	30 Kg	30 Kg
Motor speed	1400 rpm (50 Hz) – 1680 rpm (60 Hz)	1680 rpm (60 Hz)
Nominal current	2 x 3.7 A	2 x 3.7 A
Start current	2 x 18.5 A	2 x 18.5 A

Cabin	CE versions	AECO version
Cabin weight	225 kg	225 kg
Outer dimensions (W x D x H)	996 x 777 x 2850 mm	
Outer dimensions without top frame	996 x 777 x 2642 mm	996 x 777 x 2642 mm
Inner dimensions (W x D x H)	976 x 481 x 2232 mm	976 x 481 x 2232 mm
Door opening of bucket type (W x H)	920 x 1100 mm	
Door opening of full sliding door (W x H)	564 x 1988 mm	564 x 1988 mm
Top hatch dimensions (W x D)	640 x 400 mm	640 x 400 mm
Bottom hatch dimensions (W x D)	600 x 400 mm	600 x 400 mm
Lateral windows [2] dimensions (W x H)	280 x 810 mm	

Power & Control cable		CE versions	AECO version
Type	Bottom platform to junction box	18 G 2.5	7 G 4 + 12 G 1.5
	Top platform to junction box	8 G 1.5	12 G 1.5
	Travelling cable	1 x 8 G 2.5 + 1 x 10 G 1.5	7 G 4 + 12 G 1.5
Travelling cable weight (approx.)		0.6 kg/m	0.5 kg/m

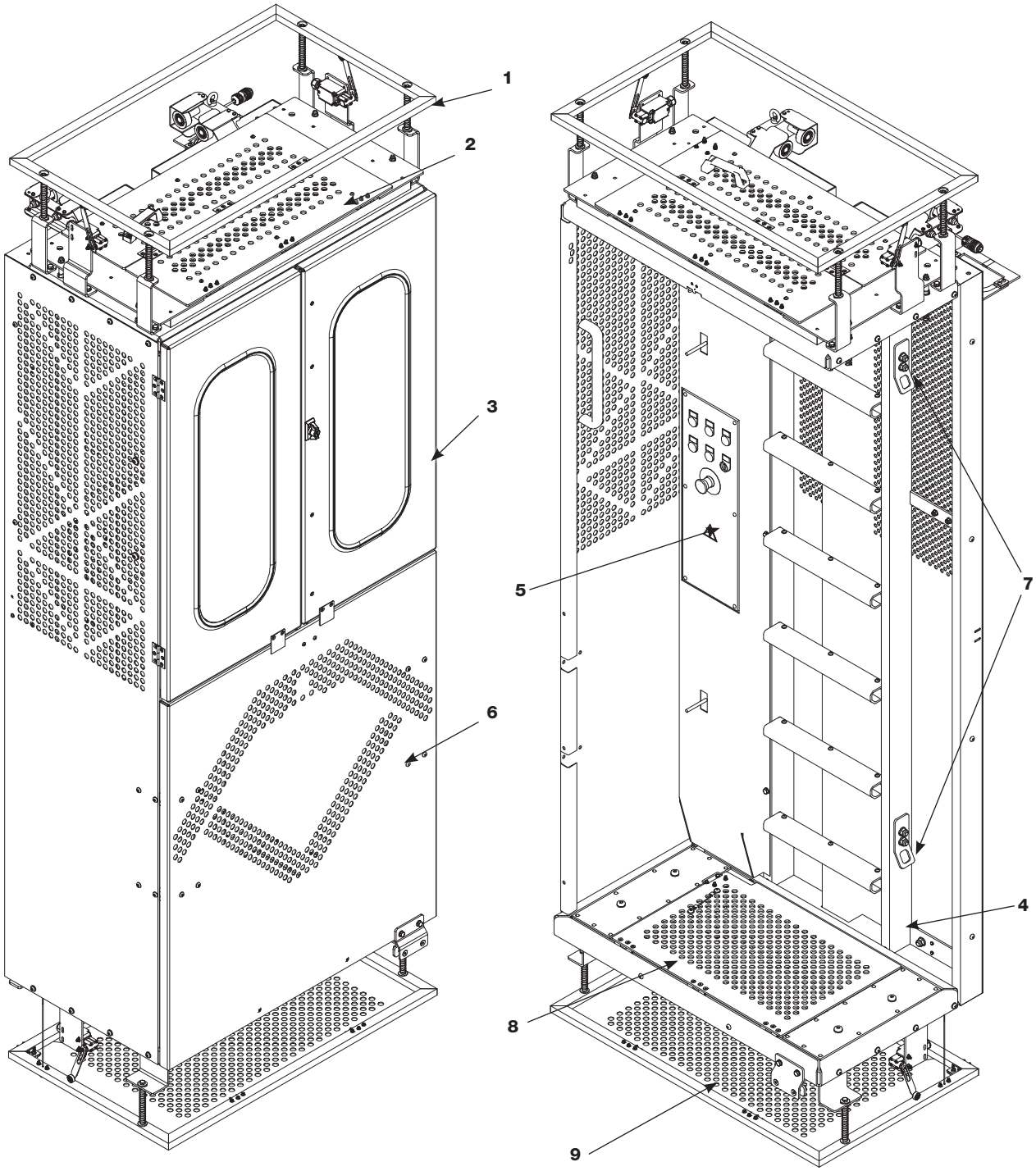
Ladder rack (Mast)	CE versions	AECO version
Dimensions	530 x 30 x 1489 mm / 530 x 30 x 2978 mm	530 x 30 x 1489 mm / 530 x 30 x 2978 mm
Weight (per piece)	15 kg / 30 kg	15 kg / 30 kg
Attachment distance	1 per mast section, max. 3000 mm	1 per mast section, max. 2100 mm

CE AECO

[2] *Note: Optional for CE versions.. Not available for AECO version.*

3.5 Service lift overview

3.5.1 Bucket type [1)]



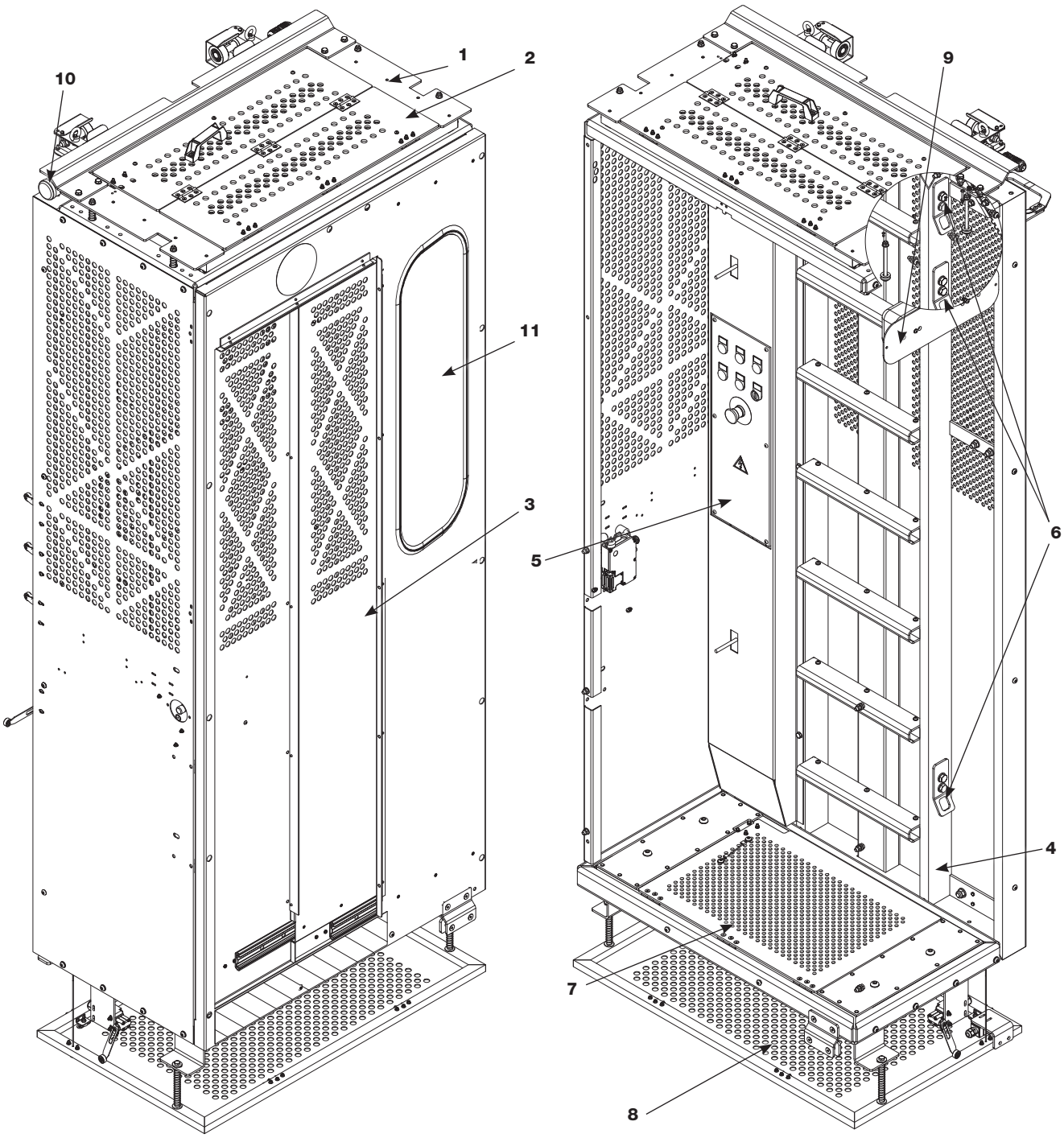
1. Top obstruction device (frame) [1)]
2. Top hatch
3. Double door
4. Main frame
5. Cabin control box
6. Fixed front
7. Anchor points for PPE (x2)
8. Bottom cabin hatch
9. Bottom obstruction device
10. Internal light [2)]
11. Warning lights (x2) [2)]

CE AECO

[1)] Optional for CE versions. Not available for AECO version.

[2)] Optional for Pegasus CE versions. Mandatory for AECO version.

3.5.2 Full sliding door [1)]



1. Top obstruction device (roof)
2. Top hatch
3. Full sliding door
4. Main frame
5. Cabin control box
6. Anchor points for PPE (x3)
7. Bottom cabin hatch
8. Bottom obstruction device
9. Internal light [1)]
10. Warning lights (x2) [1)]
11. Front window [2)]
12. Top obstruction device (frame) [3)]

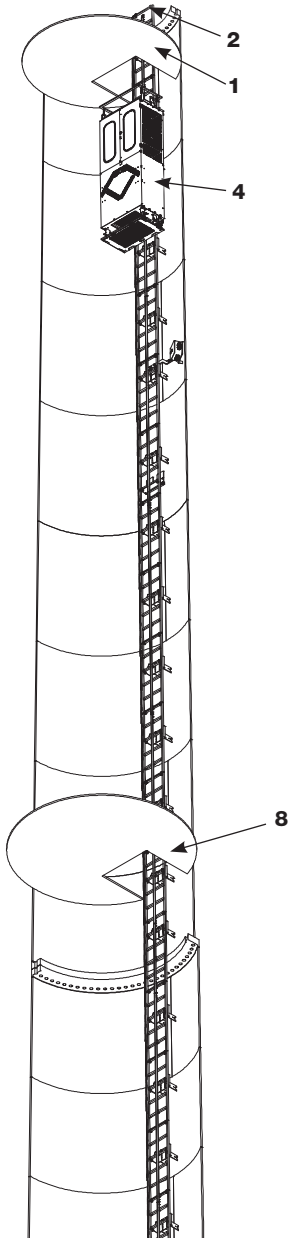
CE AECO

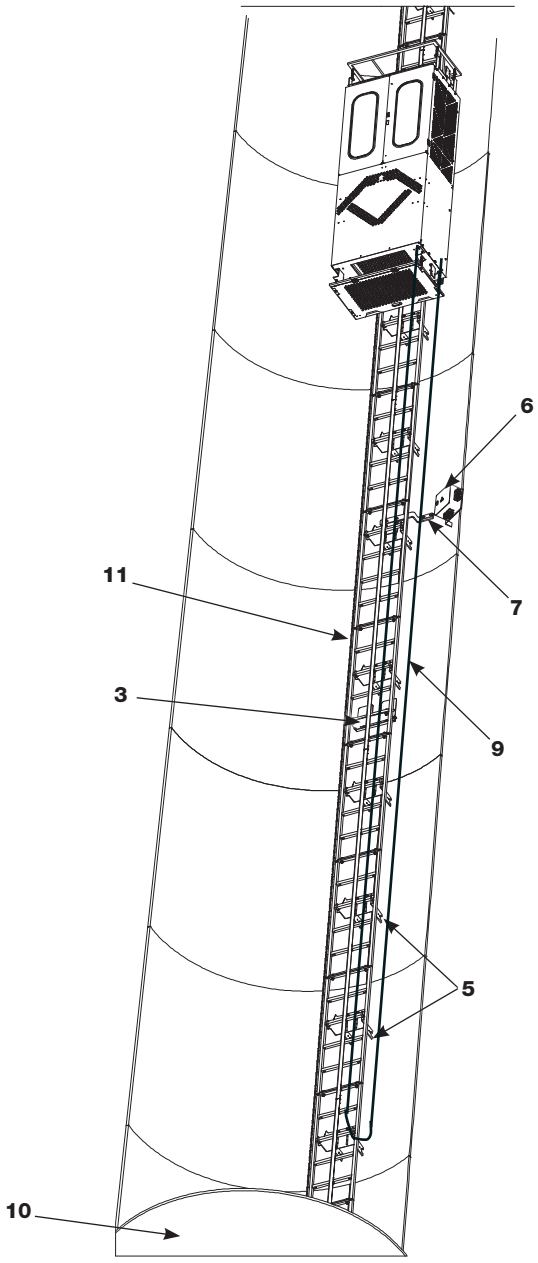
[1)] Optional for CE versions. Mandatory for AECO version.

[2)] Optional for CE versions and for AECO version.

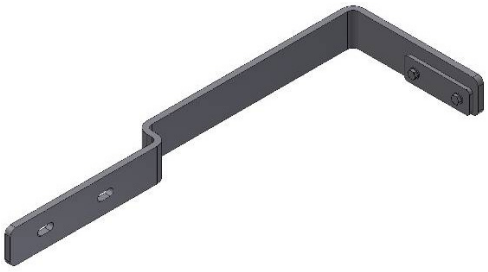
[3)] Optional for CE versions. Not available for AECO version.

3.6 General arrangement of Pegasus lift inside a generic WTG





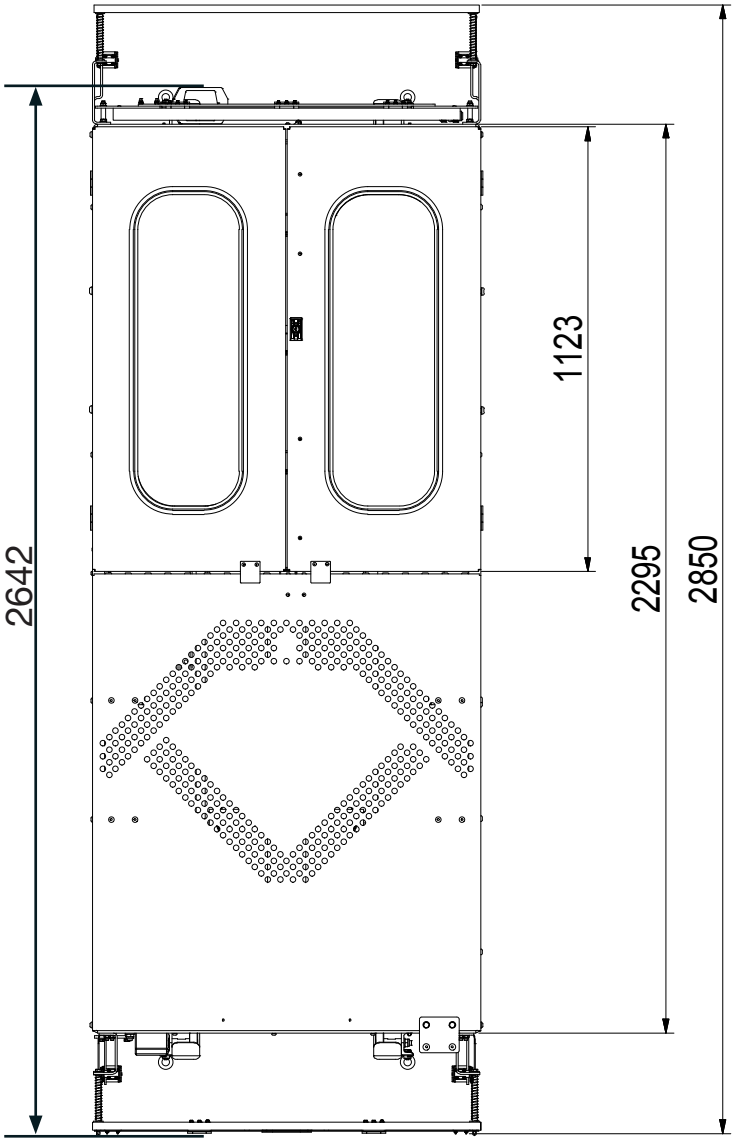
INTERMEDIATE ARM FOR ELECTRIC CABLE
This bracket is screwed to one of the anchorages of the installation. It is installed above the middle of the tower height, in order to allow the proper reeving of the electrical cable.

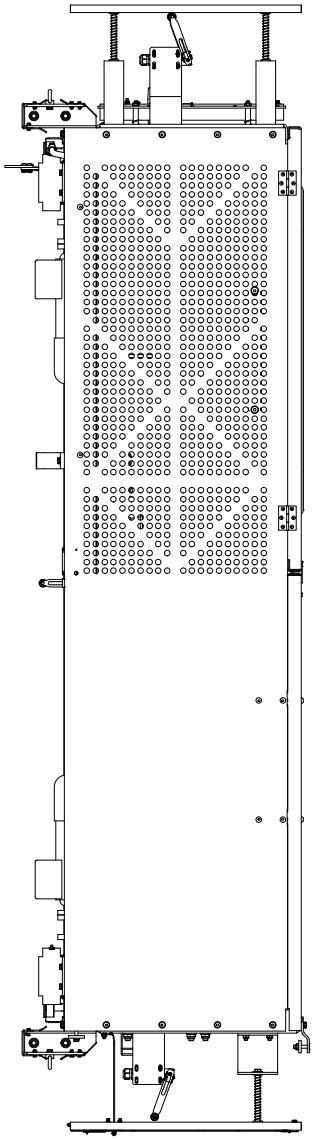


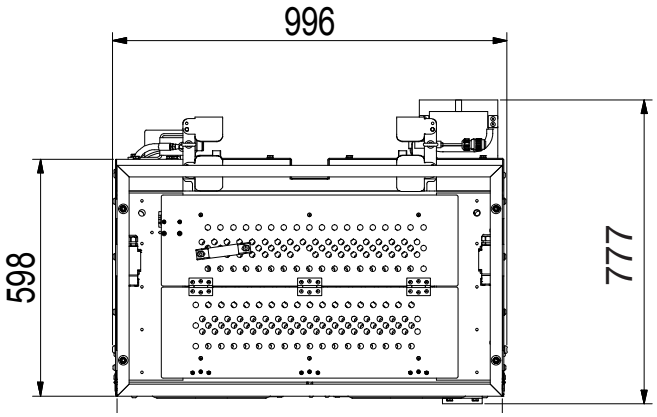
1. Top platform
2. Top mechanical stop
3. Rest platform
4. Pegasus service lift
5. Anchorages
6. Junction box
7. Intermediate arm for electric cable
8. Intermediate platform
9. Travelling cable
10. Bottom platform
11. Ladder rack

3.7 Service lift dimensions

3.7.1 Bucket type [1)]



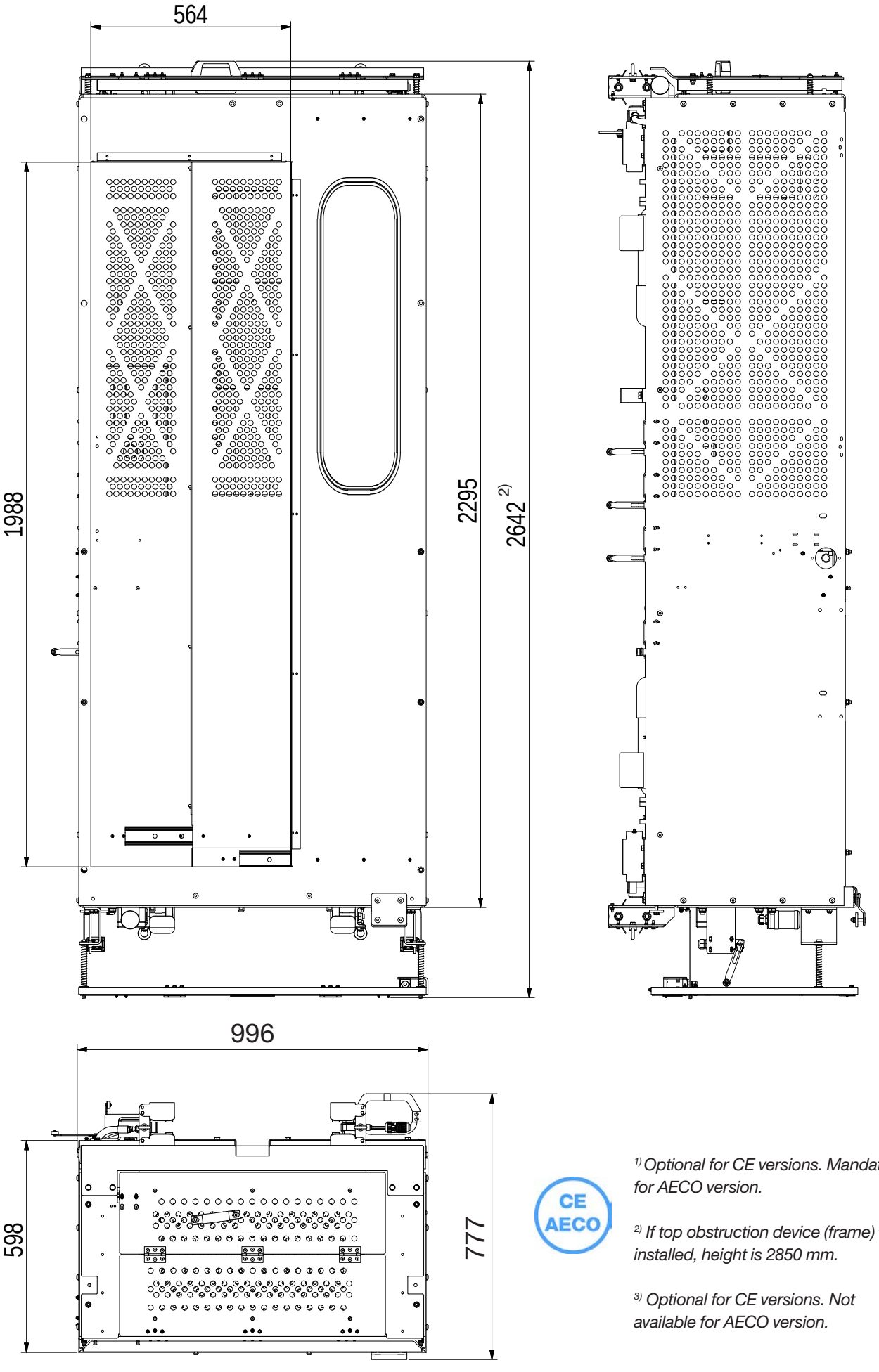




CE
AECO

[1)] Optional for CE versions.
Not available for AECO version.

3.7.2 Full sliding door [1)]



CE AECO

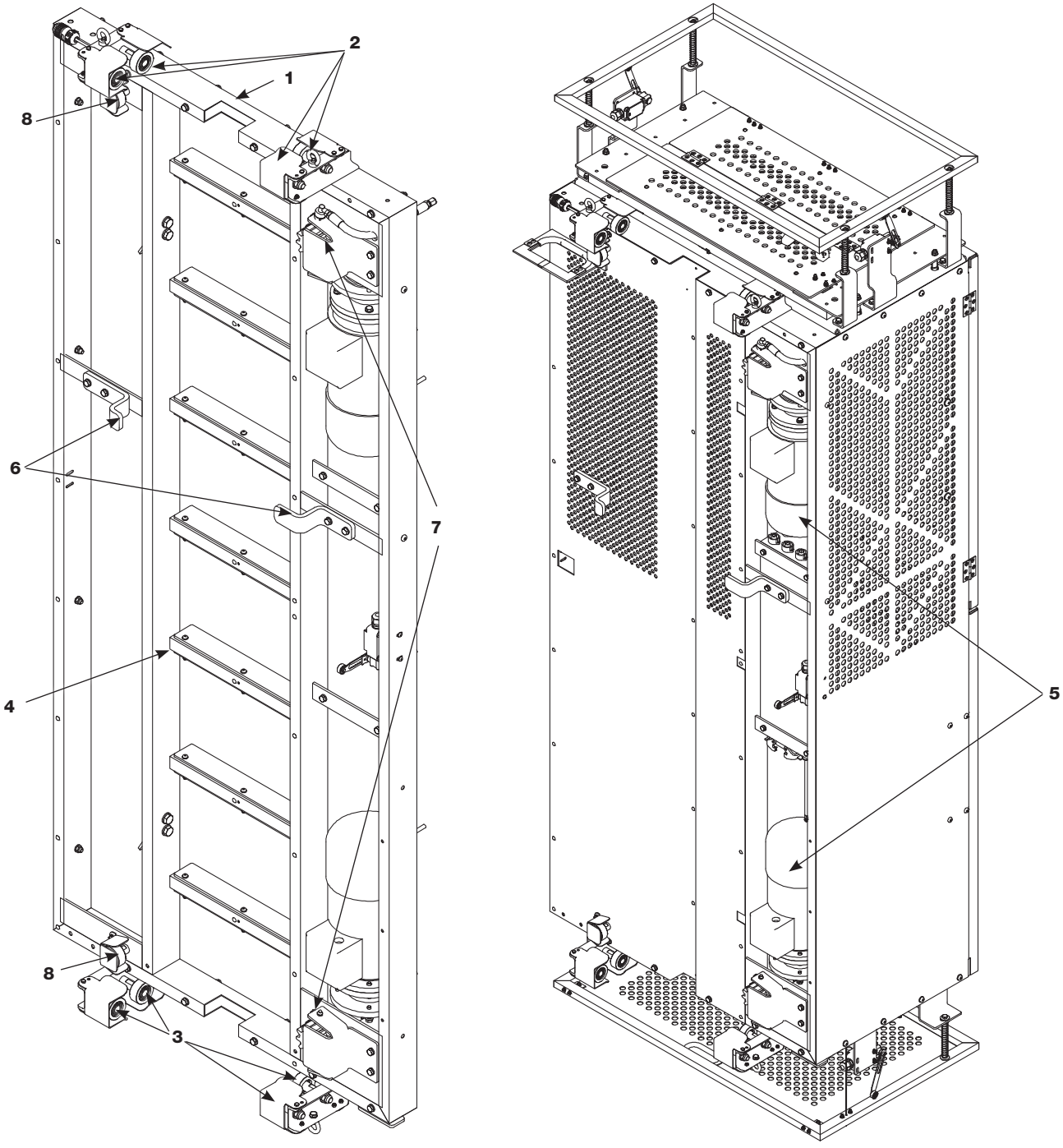
[1)] *Optional for CE versions. Mandatory for AECO version.*

[2)] *If top obstruction device (frame) [3)] is installed, height is 2850 mm.*

[3)] *Optional for CE versions. Not available for AECO version.*

3.8 Main frame

The main frame is a welded steel structure. The traction and guiding systems are bolted to the main frame.

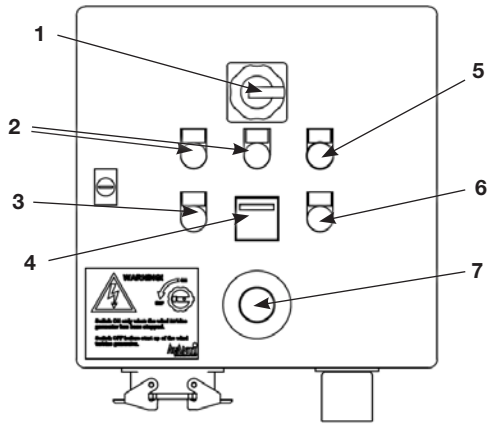


1. Main frame
2. Guiding rollers top
3. Guiding rollers bottom
4. Evacuation ladder
5. Traction system/ 2 Motor groups
6. Anti- derailment brackets
7. Pinions
8. Counter guiding rollers

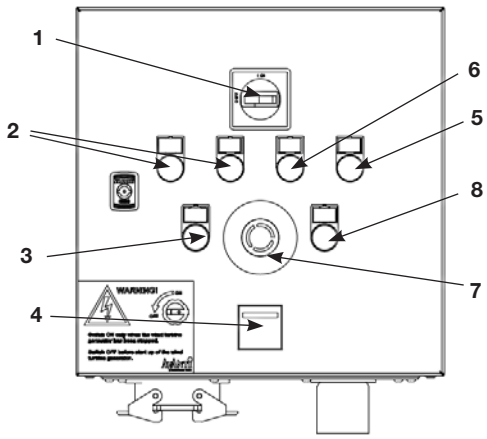
3.9 Controls

3.9.1 Bottom platform control box

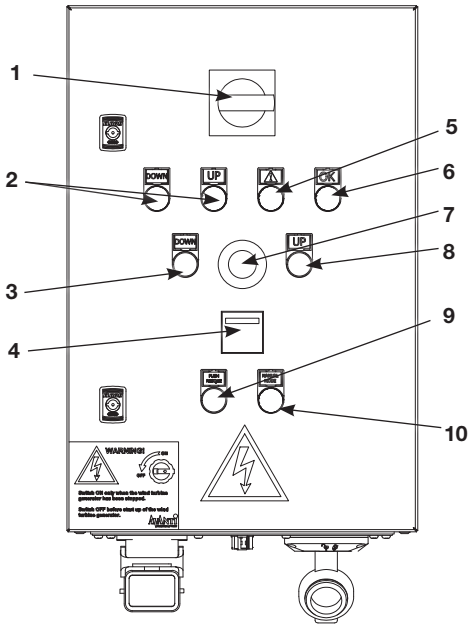
CE Call only configuration:



CE Send [1] and call configuration:



AECO configuration:



1. ON/OFF MAIN SWITCH

2. UP/DOWN LIGHTS (GREEN)
Lights up when the lift is going up or down respectively.

3. DOWN BUTTON
Press and hold DOWN button to call the lift to the bottom platform.

4. HOUR COUNTER

5. FAULT LIGHT (RED)
Lights up when there is an activated switch on the safety circuit i.e: Open door, emergency stop pressed, open hatch or the ON/OFF buttons of the cabin control box is not in the ON position.

6. READY LIGHT (GREEN)
Lights up when the box has electric current.

7. EMERGENCY STOP BUTTON
Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.

8. UP BUTTON
Press and hold UP button to send the lift to the top platform.

9. RESCUE BUTTON [2]
Press this button to enable send [1] and call functions in case of rescue. This selector is sealed and is for emergency use only.

10. MANUAL MODE LIGHT [3]
Lights up when the MANUAL/AUTO selector [2] of the cabin control box is left in MANUAL position.

The send [1] and call buttons have a delayed reponse function. A buzzer is included on the cabin control box. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

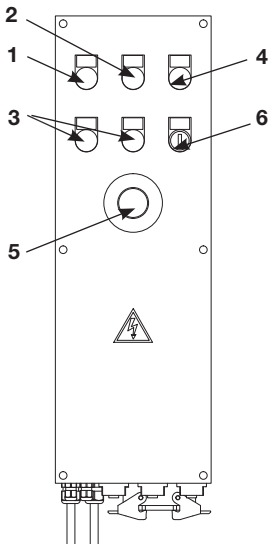
CE AECO

[1] Optional for CE versions and for AECO version.
[2] Not available for CE versions. Mandatory for AECO version.
[3] Not available for CE versions. Optional for AECO version.

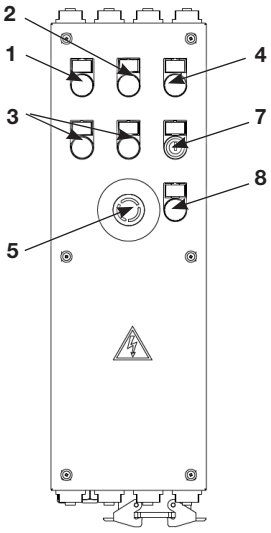
3.9.2 Cabin control box

Cabin control box inside the cabin has control priority over control boxes at platforms.

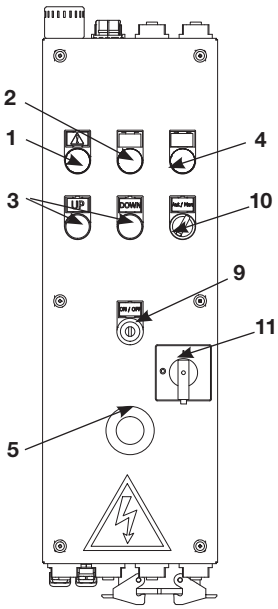
CE without lateral windows [1] configuration:



CE with lateral windows [1] configuration:



AECO configuration:



1. FAULT LIGHT (RED)
It lights up when there is an activated switch of the safety circuit (i.e. a door or hatch is open, an emergency stop button is pressed, the ON/OFF selector is at the OFF position, or a limit switch is activated).

2. PLATFORM LIGHT (GREEN)
It lights up when the lift reaches the bottom or top platform.
If the top obstruction device (frame) [1] is provided: the light lights up when the lift reaches the bottom or top platform; or when the bottom or top obstruction devices are activated.
If the platform switch (S18) [2] is provided: the light lights up when the lift reaches any platform.

3. UP/DOWN BUTTONS
Press and hold the "UP" or "DOWN" button, to ascend or descend respectively.

4. OVERLOAD LIGHT (YELLOW)
It lights up when the cabin is overloaded.

5. EMERGENCY STOP BUTTON
Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.

6. ON/OFF SELECTOR (GREEN)
It lights up when all the switches of the safety circuit are deactivated and the ON/OFF selector is at the ON position.
Select the ON position to enable control from the lift.
Select the OFF position to interrupt control from the lift.

7. CABIN KEY LOCK

8. READY LIGHT (GREEN)
It lights up when the box has electrical current and all the switches of the safety circuit are deactivated.

9. TRAPPED KEY LOCK
Insert the trapped key and turn to ON position, then the control box has electric current.

10. MANUAL/AUTO SELECTOR (GREEN) [4]
It lights up when the box has electrical current and all the switches of the safety circuit are deactivated.
Turn to the MANUAL position to enable control from the cabin control box and to interrupt control from the platform control boxes.
Turn to the AUTO position to enable control from the platform control boxes and to interrupt control of the cabin control box.

11. ON/OFF SELECTOR [4]
Select the ON position to connect the electric current.
Select the OFF position to disconnect the electric current.

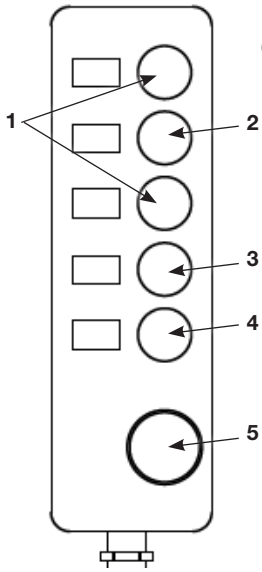
A buzzer is included on the cabin control box. The send [3] and call buttons of the platform control boxes have a delayed response function. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

CE AECO

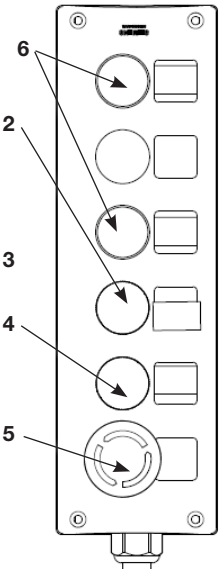
[1] Optional for CE versions. Not available for AECO version.
[2] Optional for CE bucket type version.
Mandatory for CE full sliding door version and for AECO version.
[3] Optional for CE versions and for AECO version.
[4] Not available for CE versions. Mandatory for AECO version.

3.9.3 Top platform control box

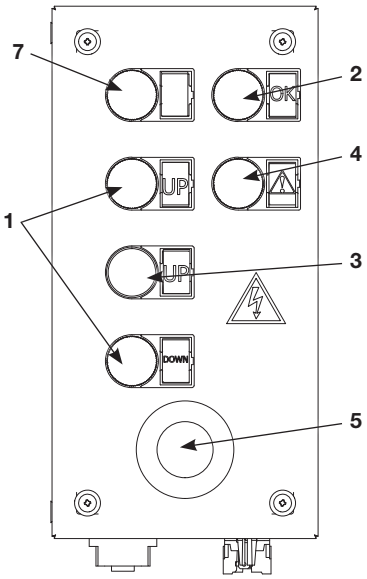
CE Call only configuration:



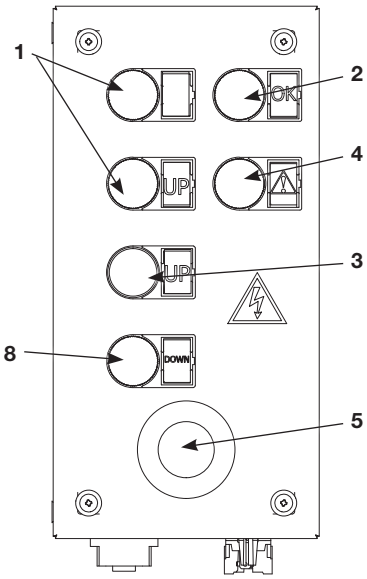
CE Send [1] and call configuration:



AECO Call only configuration:



AECO Send [1] and call configuration:

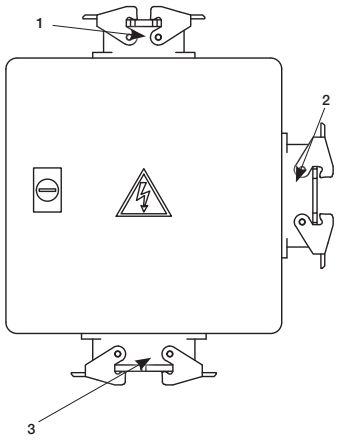


1. UP/DOWN LIGHTS (GREEN)
They light up when the lift is going up or down respectively.
2.READY LIGHT (GREEN)
It lights up when the box has electric current.
3. UP BUTTON
Press and hold the UP button to call the service lift.
4. FAULT LIGHT (RED)
It lights up when there is an activated switch on the safety circuit (i.e. an open door, emergency stop button pressed, open hatch or the ON/OFF selector of the cabin control box is not in the ON position).
5. EMERGENCY STOP BUTTON
Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.
6. UP/DOWN LIGHT BUTTONS (GREEN)
Press and hold UP/DOWN light-buttons to ascend or descend the service lift respectively. UP/DOWN light-buttons light up when the lift is ascending or descending respectively.
7. PLATFORM LIGHT (GREEN)
It lights up when lift reaches the top platform.
8. DOWN BUTTON
Press and hold the DOWN button to send the service lift.

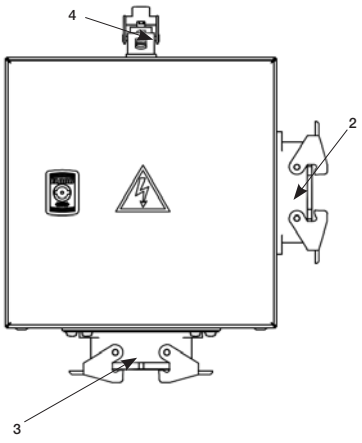
The send [1] and call buttons have a delayed reponse function. A buzzer is included on the cabin control box. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

3.9.4 Mid tower junction box

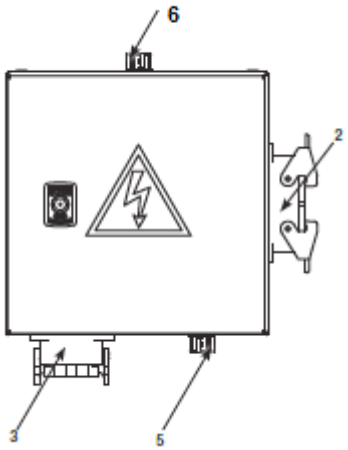
CE Call only configuration :



CE Send [1] and call configuration:



AECO configuration:



1. 10 pin connector for electrical round cable
To connect to top platform control box.
2. Connector for travelling flat cable
To supply electric power to the cabin.
3. Connector for electrical round cable
To connect to bottom platform control box.
4. 12 pin connector for electrical round cable
To connect to top platform control box.
5. Connector for control signal.
To connect to bottom platform control box.
6. Connector for control signal.
To connect to top platform control box.

CE AECO

[1] Optional for CE versions and for AECO version.

3.10 Service lift doors

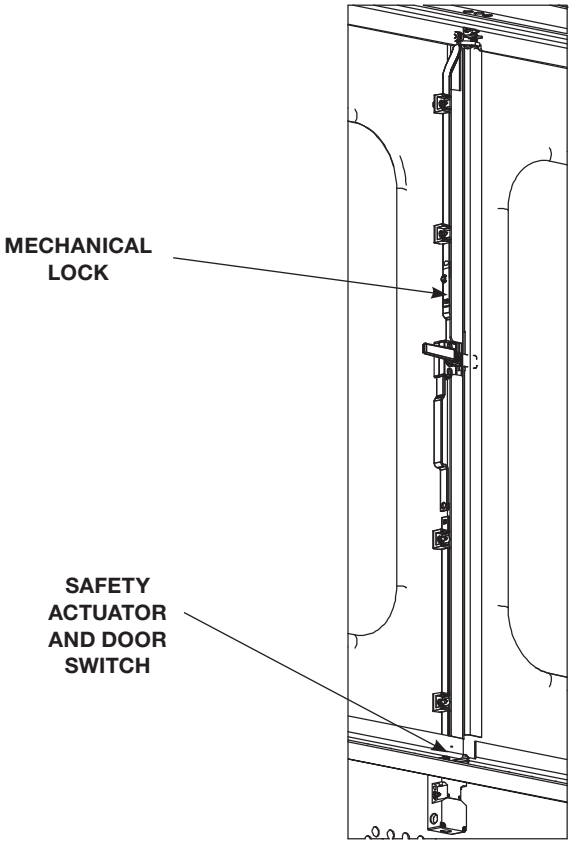
3.10.1 Double door [1)]

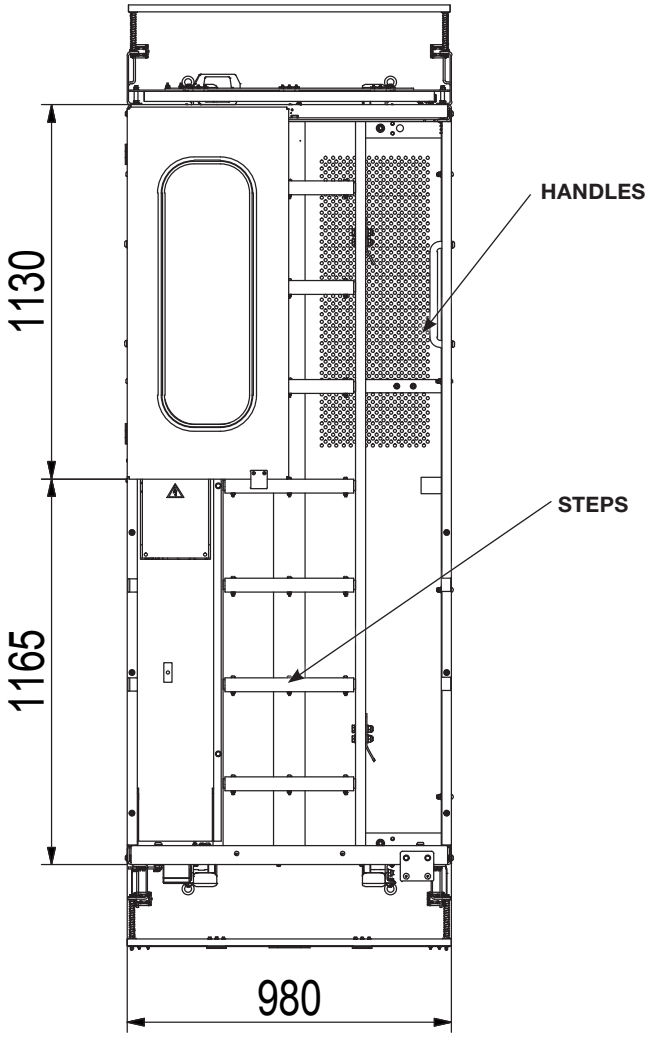
Main access to the service lift is done through the double door system installed on the front. The system consists of two hinged doors that open outwards. This door can be opened at any time. A safety switch monitors the closed function and interrupts control if the door is opened.

If the doors are not closed properly, the fault light illuminates. The steps inside the cabin are provided with non-slip surface in order to prevent the risk of falling.

When the door is open, user(s) MUST BE attached with the shock absorber to an anchor point.

A mechanical lock is also installed to lock the doors together to the fixed front.
From outside: turn the key clockwise to open the door, and anticlockwise to close it.
From inside: turn the lever anticlockwise to open the door, and clockwise to close it.





CE AECO

[1)] *Optional for CE versions. Not available for AECO version.*

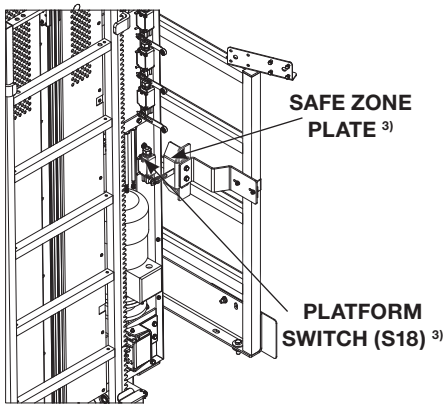
3.10.2 Full sliding door [1]

It consists of two perforated sheets that slide horizontally.

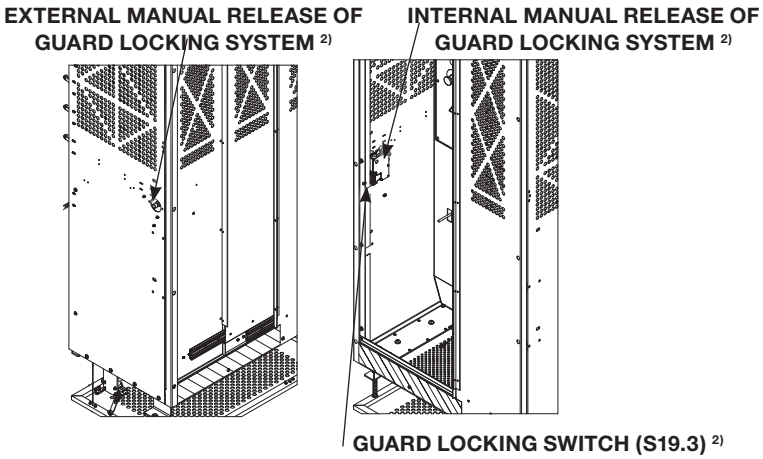
3.10.2.1 Guard locking configuration [2]

It features a guard locking system [2] that:

- Prevents service lift to travel if the door is open. This opening condition is monitored by the guard locking switch (S19.3) [2].
- Permits door to be opened only when service lift is levelled with a platform. This levelling condition is monitored by the platform switch (S18) [3] which is triggered by the safe zone plates [3].



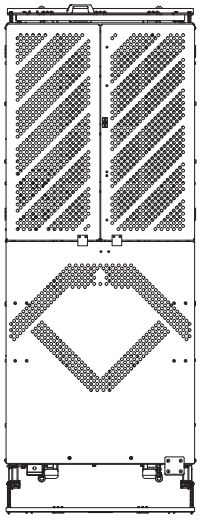
It is possible to manually release the guard locking system [2] in order to open the door between platforms for maintenance tasks or installation of WTG parts.


EXTERNAL MANUAL RELEASE OF GUARD LOCKING SYSTEM [2]
INTERNAL MANUAL RELEASE OF GUARD LOCKING SYSTEM [2]
GUARD LOCKING SWITCH (S19.3) [2]

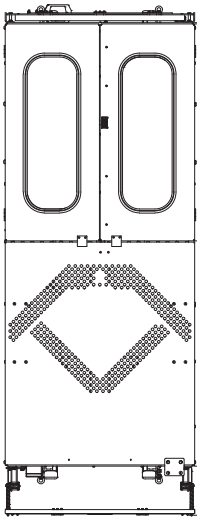
3.10.2.2 Interlock without monitoring configuration [4]

It features an interlock without monitoring [4] that does not allow the door to be opened involuntarily.
In order to open the door, the user must actuate a manual release button, which is accessible from the inside and the outside of the cabin.

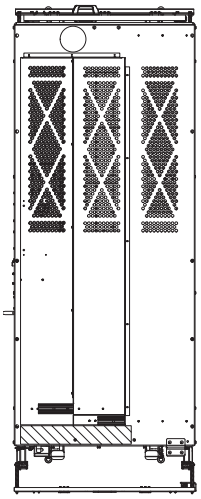
Bucket type without windows [5]:



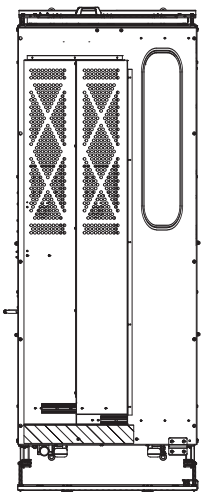
Bucket type with windows [5]:



Full sliding door without windows [6]:



Full sliding door with windows [6]



3.11 Front windows

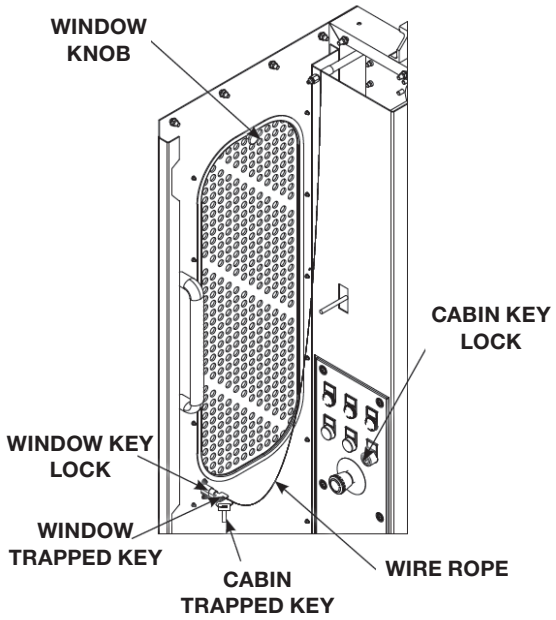
The service lift features perforations that allow visibility inside the cabin. Additionally, the service lift may feature front windows to improve visibility.

[1] Optional for CE versions. Mandatory for AECO version.
[2] Mandatory for CE full sliding door version. Not available for AECO version.
[3] Optional for CE bucket type version. Mandatory for CE full sliding door version. Optional for AECO version.
[4] Not available for CE full sliding door version. Mandatory for AECO version.
[5] Optional for CE bucket type version.
[6] Optional for CE full sliding door version. Optional for AECO version.

CE AECO

3.12 Lateral windows [1)]

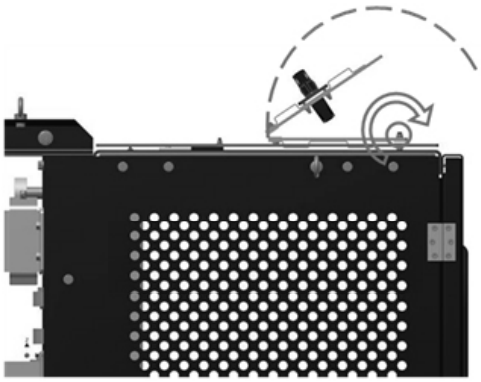
Optionally, the service lift can be equipped with lateral windows [1)]. These windows facilitate service tasks of tower internals from inside the cabin.
In order to open a window, the cabin trapped key must be removed and the window trapped key must be used. Both trapped keys are attached to the same wire rope, this way service lift cannot travel if a window is open.



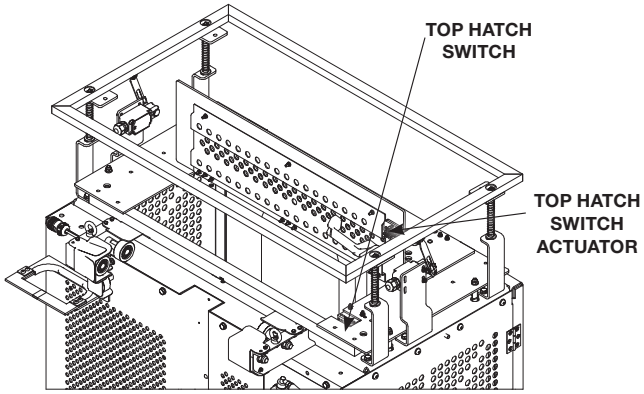
STOP *Cabin trapped key and window trapped key shall be attached to the same wire rope at all times.*

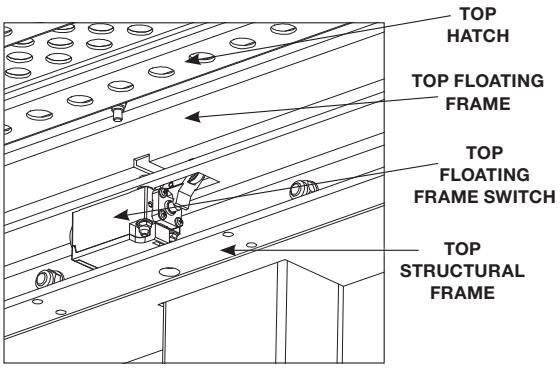
3.13 Top hatch

The top hatch consists of a double hinged sheet, that minimizes necessary space to open it.
This hatch is used to evacuate the service lift or to access the top platform.



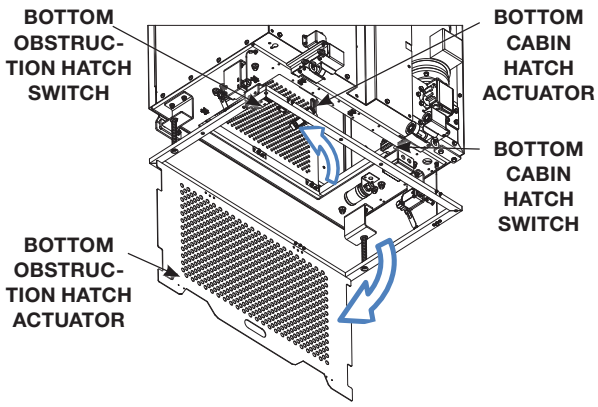
The dimensions of the clear opening are 640 x 400 mm.
A switch interrupts control if the hatch is open or not properly closed. In this case the fault light illuminates.
The top hatch is mounted over a top floating frame.
If a person stands on the top floating frame, a switch is triggered and control is interrupted. This prevents misuse of the service lift; e.g. persons riding on top.





3.14 Bottom hatches

The bottom cabin hatch and the bottom obstruction hatch consist of a perforated sheet that open inwards and outwards respectively. They are used in case of evacuation. A corresponding switch interrupts control if one these hatches is opened or not closed properly. In this case the fault light of the cabin control box illuminates. The dimensions of the clear opening are 600 x 400 mm.


BOTTOM OBSTRUC-TION HATCH SWITCH
BOTTOM CABIN HATCH ACTUATOR
BOTTOM CABIN HATCH SWITCH
BOTTOM OBSTRUC-TION HATCH ACTUATOR

CE AECO

[1)] Optional for CE versions. Not available for AECO version.

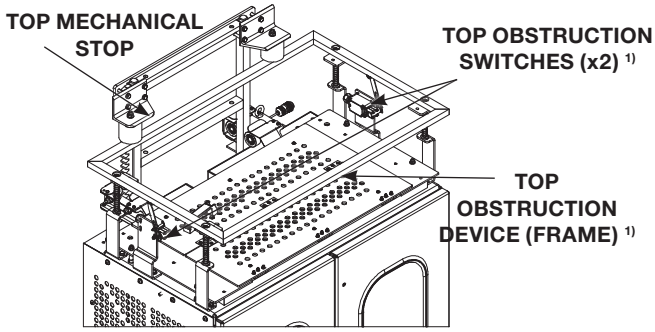
3.15 Top obstruction device

3.15.1 Frame configuration [1)]

The top obstruction device (frame) interrupts ascent if:

1. It encounters an obstacle.
2. It reaches the top platform.

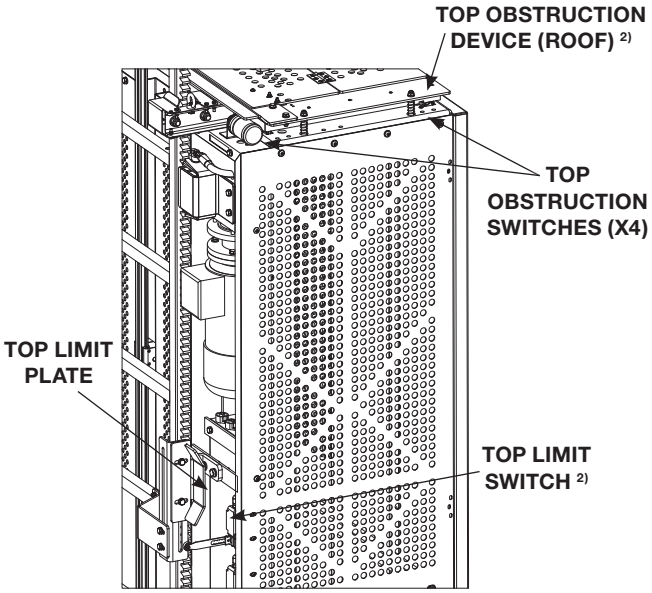
Descent is still possible; i.e. to remove the obstacle.



3.15.2 Roof configuration [2)]

The top obstruction device (roof) [2)] interrupts control if it encounters an obstacle.

The top limit switch [2)] interrupts ascent if the service lift reaches top platform.



3.16 Bottom obstruction device

3.16.1 Without bottom limit switch configuration [3)]

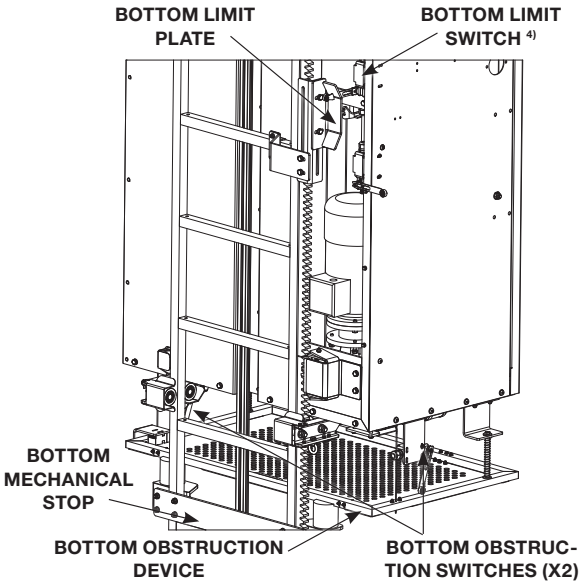
The bottom obstruction device interrupts descent if:

1. It encounters an obstacle.
2. It reaches the bottom platform.

Ascent is still possible; i.e. to remove the obstacle.

3.16.2 With bottom limit switch configuration [4)]

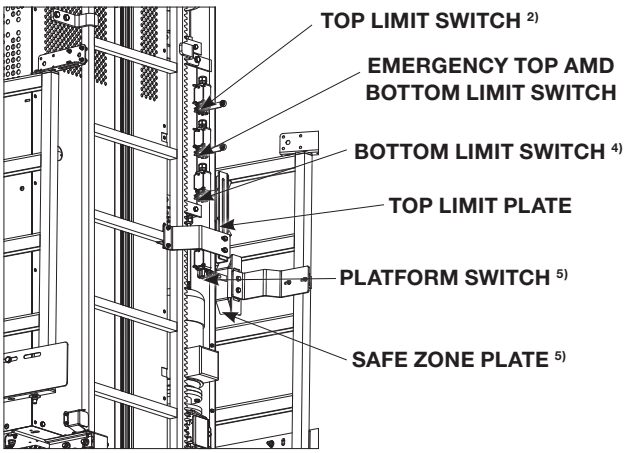
The bottom obstruction device interrupts descent if it encounters an obstacle. The bottom limit switch [4)] interrupts descent if the service lift reaches the bottom platform.



3.17 Emergency top and bottom limit switch

The emergency top and bottom limit switch interrupts the control if top limit switch [2)] or top obstruction switches fail, or if bottom limit switch [4)] or bottom obstruction switches fail.

This switch is triggered by the bottom limit plate and top limit plate located at bottom and top platforms respectively. To release the switch at bottom platform: temporarily remove the switch lever, put the lever back afterwards and verify adjustment. To release the switch at top platform, perform manual descent some metres.


TOP LIMIT SWITCH [2)]
EMERGENCY TOP AMD BOTTOM LIMIT SWITCH
BOTTOM LIMIT SWITCH [4)]
TOP LIMIT PLATE
PLATFORM SWITCH [5)]
SAFE ZONE PLATE [5)]

3.18 Top and bottom mechanical stops

Top and bottom mechanical stops are installed on the ladder and act as travel limits.

CE AECO

[1)] Optional for CE versions. Not available for AECO version.
[2)] Optional for CE versions. Mandatory for AECO version.
[3)] Mandatory for CE versions. Optional for AECO version.
[4)] Not available for CE versions. Optional for AECO version.
[5)] Optional for CE bucket type version. Mandatory for CE full sliding door version. Mandatory for AECO version.

3.19 Traction system

The traction system is rack and pinion type. The system has two motor group working on the same rack. They are installed on the main frame of the cabin. Each motor groups has a centrifugal brake, a gear box, a pinion and a brake motor. Each motor brake includes a manual release lever allowing a manual descent in absence of electric current.

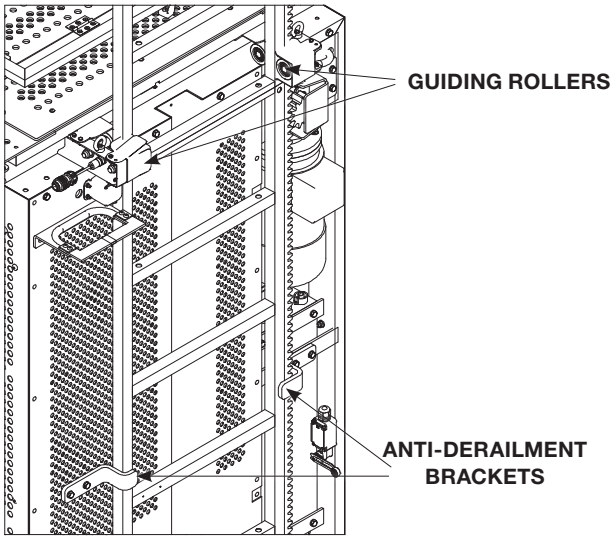
3.20 Guiding and anti-derailment system

The service lift is guided along the stiles of a ladder by means of ten guiding rollers.

An inductive sensor detects the presence of the stile. If the stile is not detected (bigger distance than setting), control is interrupted, avoiding derailment of the service lift.

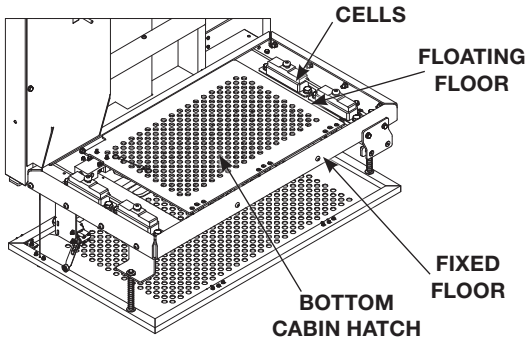
After a short circuit, check that the inductive sensor and its light work properly.

The service lift features two anti-derailment brackets that prevent derailment if guiding rollers fail.



3.21 Overload limiter

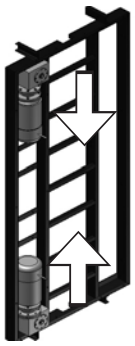
The overload detection system prevents any movement of the service lift in the event of an overload. In case of an overload, the overload light (yellow) lights up.
This system consists of a floating floor with four load cells. The load cells send the load signal to the electronic equipment of the cabin control box.



3.22 Manual descent system

Each motor group features a hand lever, that allow manual release of the motor electromagnetic brake. Once the motor brakes are released, the service lift descends with a controlled speed limited by the centrifugal brake installed in each motor group.

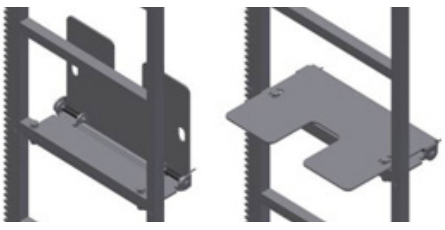
Push hand levers upwards and downwards at the same time to perform manual descent and always look through the perforated sheet holes.



3.23 Rest platforms

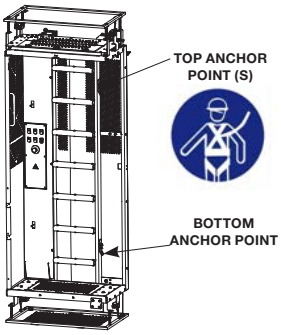
There is a rest platform at least every 6 metres. The rest platforms are attached to the ladder on the ladder section connection.

Rest platforms are self folding using torsion springs so they do not interfere with the cabin movement when they are not used.



3.24 Anchor points for PPE

The service lift is equipped with two anchor points inside the cabin in bucket type version and three anchor points in full sliding door versions. In case of evacuation, the evacuation procedure must be followed (see “Appendix A: Safety measures”).



Each anchor point may only be used by one user simultaneously.

3.25 Information signs and documents

The following documents, signs and stickers are supplied with the service lift and shall always be available.

Document	Position
Serial number plate	Inside the cabin.
Manual	Inside the blue bag.
Quick guide	Inside the cabin.
Evacuation guide	Inside the cabin.
Rescue guide	Close to the bottom platform control box.
Use of PPE sticker	On the motor cover.
Work load / N° persons sticker	On the front side of cabin.
Warning risk of falling sticker	On the motor cover.
Warning risk of crushing sticker (x2)	On the pinion covers.
Manual descent sticker	On the motor cover.
Wiring diagram	Inside the bottom platform control box.
Eletrical warning disconnection sticker	On the bottom platform control box.
UL sticker [2] Electric warning disconnection sticker	Underneath the cover of the bottom platform control box.
Alignment stickers	Inside the cabin and at each landing
Lubrication sticker	On the motor cover.
No standing on top prohibition sticker [1]	On the front side of the cabin.
Top clearance sticker [2]	On the front side of the cabin.
Maintenance brake sticker [2]	Inside the cabin.
Measurement of pinion and rack [2]	Inside the cabin.
AECO Data plate [2]	Inside the cabin.
Jurisdictional Code Data plate [2]	On the motor cover.
Pull to release sticker [2]	On the cabin control box.
Electrical hazard sticker	On the cabin control box.
Electrical hazard sticker	On the weighing module box [2].

3.26 Internal light [1]

The service lift is equipped with a light inside the cabin. When service lift is connected to power supply, this light illuminates at all times.

The internal light is battery packed in order to illuminate the inside of the cabin in case of a power failure. When fully charged, it will last at least for 30 minutes. The internal light has a flexible cable [1] and hangers [1] that allow to place it where convenient during maintenance tasks.

3.27 Warning lights [1]

A set of warning lights is mounted on the top and on the bottom of the service lift. The flashes warn that the service lift is moving.

3.28 Platform fences

The platform fences protect users from falling through the service lift hole at platforms.

CE AECO

These platform fences shall comply with:

- *EN 14122-3 for Pegasus CE bucket type version. They shall have non-slip rails or steps facilitating access to the lift and to the guiding ladder from the platforms and shall have no doors.*
- *EN 14122-3 for Pegasus CE full sliding door version. They shall feature a fence door monitored by a guard locking system, or a trapped key system, preventing any movement of the lift if the fence doors are not closed and locked.*
- *5.11 of ASME A17.1-2012/CSA B44-13 for Pegasus AECO version. Given that call function is included, the fence doors shall be monitored by a guard locking system, or a trapped key system, preventing any movement of the lift if the fence doors are not closed and locked.*

3.29 Differential controller [2]

The service lift is equipped with a differential controller that interrupts control after 1 second, in case of a motor malfunction (i.e. a motor is not working or the motors are rotating at different rpm) or in case of a safety switch malfunction (i.e. the lift encounters an obstacle and the obstruction and limit switches do not work).

The differential controller is located inside the cabin control box and it is sealed to avoid uncontrolled manipulation. It has a green light to indicate that no malfunction is detected. If any of the red lights are lit up, the differential controller has tripped and hence interrupted control.

CE AECO

[1] Optional for CE versions. Mandatory for AECO version.
[2] Not applicable to CE versions. Mandatory for AECO version.

4. Instructions for use

4.1 Cautions

Aspects to consider for a good use of the service lift:

1. No person is on the ladder when the service lift is in operation.
2. The service lift is free of objects.
3. No objects are located on the top of the cabin.
4. Electrical system is properly insulated.

The ladder and rest platforms must be used only for evacuation or when the service lift is out of service.

In the bucket type version: users inside the cabin shall be attached to an anchor point when door is open. In full sliding door [1] version: users inside the cabin shall be attached to an anchor point at all

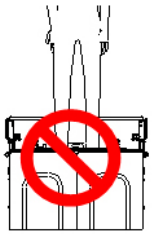
(If the MANUAL/AUTO selector [1] on cabin control box is provided) After using service lift and before exiting the WTG, the MANUAL/AUTO selector of cabin control box shall be turned to the AUTO position. This way it will be possible to call the lift from top platform if necessary.

4.2 Prohibited uses

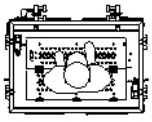
The following prohibitions shall be observed when using the service lift. The consequences of not following them are extremely hazardous to the physical integrity of the users.

It is prohibited to:

1. Use the service lift beyond its intended purpose.
2. Operate the lift without following the safety warnings and operating instructions.
3. Load the service lift more than its rated load.
4. Try to repair machine components. Only personnel from AVANTI or qualified personnel authorised by AVANTI are allowed to perform service on the service lift.



5. To travel on service lift roof.
6. To use the emergency manual release of door lift or fence doors during normal use.



7. To manipulate switches or safeties.
8. To disattach trapped key [2] from wire rope.
9. To have a second trapped key [2].

4.3 Operation from inside the cabin

1. Turn the ON/OFF main switch of the bottom platform control box to the ON position.
2. Open the door, climb the fence-railing and go inside the cabin and close the door.
3. Turn the ON/OFF selector of the cabin control box to the ON position.
4. To go up or down, press and hold the UP or DOWN button as needed.

4.4 Operation from bottom platform

To send [3] or call the service lift from the bottom platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP [3] or DOWN button.

Coordinate send [3] or call actions between personnel by means of walkie-talkies.

The transportation of persons is forbidden if the operation is controlled from the platforms.

4.5 Operation from top platform

To send [3] or call the service lift from the top platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP or DOWN [3] button.

4.6 Landing alignment

The service lift can be landed at any platform totally aligned to permit safe egress and ingress. To do so:

1. Travel to desired platform (bottom, intermediates and top one).
2. Locate the service lift so that alignment sticker of inside the cabin overlaps alignment sticker of the ladder.

2B. If a platform switch [4] is provided, locate service lift so that platform light [4] of cabin control box illuminates.

3. Exit from cabin can be done safely.

4.7 Enter and exit cabin

4.7.1 Bucket type [5]

To enter the cabin:

1. Open the door and attach the shock absorber to the cabin anchor point.
2. Climb the fence-railing holding the handles.
3. Climb down using the cabin steps.

To exit the cabin:

1. Attach the shock absorber to the cabin anchor point and open the door.
2. Climb up the cabin using the cabin steps and holding the handles.
3. Climb down the fence-railing to the platform.

[1] Not applicable to CE versions. Mandatory for AECO version.
[2] Optional for CE versions. Mandatory for AECO version.
[3] Optional for CE versions and for AECO version.
[4] Optional for CE bucket type version. Mandatory for CE full sliding door version and for AECO version.
[5] Optional for CE versions. Not available for AECO version.

4.7.2 Full sliding door [1)]

To enter the cabin:
1. Open the door.
2. Enter the cabin.
3. Attach the shock absorber to the cabin anchor point.
4. Close the door.

To exit the cabin:
1. Open the door.
2. Exit the cabin.
3. Release the shock absorber from the cabin anchor point.
4. Close the door.

4.7.3 Top / Bottom hatch

To enter the cabin:
1. Climb the ladder attached to the fall protection system or attach the shock absorber to the tower anchor.
2. Open the hatch.
3. Attach the shock absorber to the cabin anchor point.
4. Release the fall protection device or shock absorber from the tower anchor point to enter the cabin.
5. Climb inside the cabin holding the handles [2)] and the cabin main frame ladder as support.
6. Close the hatch

To exit the cabin:
1. Attach the shock absorber to the cabin anchor point.
2. Open the hatch.
3. Climb out of the cabin using the handles [2)] and the cabin main frame ladder as support.
4. Attach to the fall protection system or attach the shock absorber to a tower anchor point.
5. Release the shock absorber on the cabin anchor point.
6. Close the hatch.

WTG manufacturer must ensure that access to the top platform or nacelle can be done safely to avoid risk of falling.

4.8 Lateral windows [3)]

To open a window:
1. Remove cabin trapped key from cabin key lock.
2. Insert window trapped key in the window key lock.
3. Turn the window trapped key clockwise.
4. Pull the window knob downwards to open the window.

To close the window:
1. Pull the window knob upwards to close the window.
2. Push and turn anticlockwise the window trapped key.
3. Release the window trapped key.
4. Insert the cabin trapped key in the cabin key lock.

4.9 Emergency stop button

Release the UP/DOWN buttons and the service lift should stop. If it does not, push the emergency stop button, and all controls should be disabled.
Turn / pull the emergency stop button to reset the control.

4.10 Manual descent

In case of power failure or an operation fault, a controlled descent without power can be performed. To do so:
1. Remove the seals of the hand levers of the motor brake.
2. Check that there are no obstacles or person on the way.
3. Push the top and bottom hand levers simultaneously, downwards and upwards respectively. The service lift will start descending.
4. To stop, simply loosen the hand lever.

A buzzer [4)] will sound during manual descent.

The manual descent shall only be performed if it is strictly necessary.

STOP *During the manual descent, the door and hatches of the lift shall be kept closed.*

STOP *Always look through the perforated floor of the cabin to see if anyone is standing on the ladder.*

STOP *Use the walkie-talkie to report about the manual descent.*

STOP *During the manual descent, stop the service lift just before reaching the bottom platform floor. This way, the bottom obstruction device will not get damaged.*

STOP *The manual descents shall be of maximum 30 m. Between two consecutive manual descents, the user shall wait minimum 10 minutes for centrifugal brakes to cool down. This way, the premature wear of the centrifugal brakes will be prevented.*

4.11 Rest platforms

If use of rest platforms is needed:
1. Climb up on the ladder to be one step above the rest platform.
2. With the safety of all your PPE, push down the rest platform with your foot.
3. Once platform is properly supported on the rung, stand over it with both feet.
4. The rest platform returns to its folded position once it is not in use.

Always wear all the PPE and attach the fall protection device to the fall protection rail system of the ladder.
User(s) in a rest platform MUST ALWAYS BE attached safely to the fall protection system.

4.12 Service ladder

The service lift uses a ladder as support and guide. In case of failure of the lift, this ladder is used to evacuate people (see “Appendix A: Safety measures”).

CE AECO

[1)] Optional for CE versions. Mandatory for AECO version.
[2)] Applicable to CE bucket type only.
[3)] Optional for CE versions. Not available for AECO version.
[4)] Applicable to AECO version only.

5. Out of Service

1. Securing the service lift:
Bring the service lift all the way down, until the lift reaches bottom platform.

2. Turn off the main switch to prevent inadvertent operation of the lift:
Turn the main switch to the OFF position. Power supply is now interrupted. Mark the lift “OUT OF SERVICE” and padlock as necessary. Contact AVANTI or qualified personnel authorised by AVANTI.

6. Maintenance

A maintenance is required and necessary:

- To avoid premature wear
- To prolong the lifetime of the machine
- To maintain the level of safety which the service lift was designed and manufactured to.

6.1 Maintenance planning

Perform the inspections filling in the "Appendix B: Inspection checklist" and the "Appendix C: Inspection log sheet" for future reference.

Frequency	Performed by	Inspection checklist reference	Components
Daily	Supervisor	1	Travel zone
		2	Control and safety devices
		3	Cabin
Annually and in the inspection before the first use	AVANTI or qualified personnel authorised by AVANTI	1	Travel zone
		2	Control and safety devices
		3	Cabin
		4	Guiding system
		5	Doors and hatches
		6	Electrical system
		7	Electronic system
		8	Traction system
		9	Overload limiter
		10	Trapped key
		11	Guard locking
		12	Platforms
		13	Information signs and documents
		14	Final assessment

6.2 Cautions

STOP *Before any maintenance operation check that the service lift is out of service.*

STOP *If any faults occur during work,*
- Stop working,
- If required secure the workplace and
- Rectify the fault!

STOP *Make sure that nobody is exposed to danger below the service lift, for instance from falling parts.*

STOP *Before any maintenance task, ensure that walking way surfaces are dry and not slippery.*

During maintenance tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment (when falling height is more than 2 m), hand gloves, helmet, safety glasses and working gear.
- Place service lift at bottom platform and disconnect power supply.
- Use an electricity measuring tool when performing inspection of electrical components.
- Use a hand winch attachable to the ladder when handling big/ heavy loads and shall be performed at least by 2 persons.
- The panel parts shall be removed to facilitate access to confined spaces.
- The guiding rollers shall be replaced one by one.
- Use a cable grip when replacing travelling cable.
- Keep service lift doors closed when using a 3-step ladder.

! *Only AVANTI or qualified personnel authorised by AVANTI shall perform electrical installation tasks.*

6.3 Daily inspection

! *Daily inspection of the service lift shall only be performed by personnel authorised by AVANTI. If there is more than one user, the employer shall appoint a supervisor in charge of the daily inspection.*

6.3.1 Travel zone

1. Ensure that there are no obstacles within the service lift's travel zone which may obstruct the travel of the cabin or hit the cabin.
2. Ensure that the ladder rack is solidly and safely fixed.

6.3.2 Visual inspection

1. Check that the service lift components are mounted in accordance with the specifications and without any noticeable defects or missing components.
2. Check that the traction system (ladder rack & pinion) is not damaged or jammed.
3. Check that the guided system is not damaged or jammed.
4. Check that the two motor groups are in good conditions and not damaged.

6.3.3 Functional inspection

Check that the safeties are in place and working.

6.3.3.1 BOTTOM PLATFORM CONTROL BOX

1. Main switch ON/OFF: Turn the ON/OFF electric isolator on the bottom platform control box to the OFF position. The green light shall be OFF. The service lift shall not run. Turn it ON; the green light shall be ON.
2. Emergency stop button: The service lift shall not move UP/DOWN. Release the emergency stop button and drive the lift UP approximately 1 m.
3. Press UP/DOWN buttons on the control box. The lift should travel upwards or downwards.

6.3.3.2 CABIN CONTROL BOX

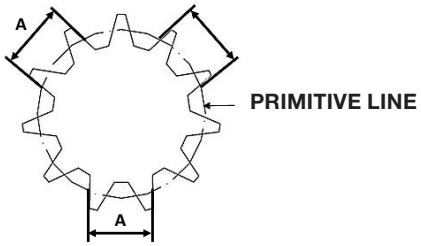
1. ON/OFF selector: Turn the ON/OFF selector on the cabin control box to the OFF position. The green light shall be OFF. The service lift shall not be able to run. Turn it ON; the ready light (green) shall be ON. The service lift shall be able to run.
2. Emergency stop button: Press the emergency stop button. The service lift shall not move UP/DOWN. Release the emergency stop button and drive the lift UP approximately 1m.
3. Fault light: Press the emergency stop button, the fault light (red) of the cabin control box shall be ON.
4. Top and bottom hatch: Open the hatch, the fault light (red) shall be ON and the lift shall not move UP/DOWN.
5. Service lift door: Open the door, the fault light (red) shall be ON and the lift shall not move UP/DOWN.
6. Drive the service lift DOWN until the bottom obstruction device hits the bottom mechanical stop. The lift shall stop.
7. Drive the service lift UP until the top obstruction device hits with the top mechanical stop. The lift shall stop.
8. Pull down the top hatch handle until the roof switch is activated, the fault light (red) shall be ON and the lift shall not move.

6.4 Annual inspection

Annual inspection may only be performed by AVANTI or qualified personnel authorised by AVANTI.

6.4.1 Pinions

Check that the pinions are free from deterioration, damage or abrasion.
Measure the wear limit of the pinion on the primitive line and at 3 different points, each separated 120°. The “A” dimension shall be between 26.49 and 27.49 mm.



The pinion replacement criteria is shown in the table below:

DIMENSION	NEW PINION (mm)	REPLACEMENT CRITERIA (mm)
A	27.49	< 26.49

6.4.2 Ladder rack

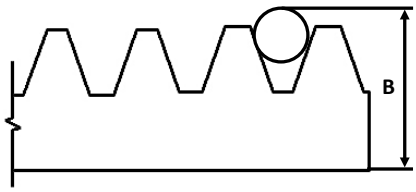
The personnel shall inspect the full length of the ladder by climbing along the ladder.

1. Check that the rack is free from deterioration, damage or abrasion.
2. Check that the ladder has no cracks, dents or damages.

The detailed instructions of the measuring procedure of the rack and pinions are available from AVANTI upon request.

6.4.2.1 Wear limit

1. Using a calibrated rod of Ø 12 mm h6, check that the dimension control “B” is between 33.39 and 34.59 mm.
2. Repeat this measurement on each mast section.

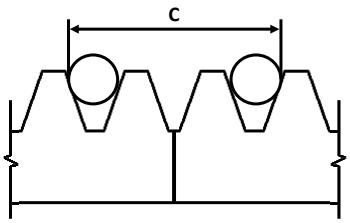


The rack replacement criteria is shown in the table below:

DIMENSION	NEW RACK (mm)	REPLACEMENT CRITERIA (mm)
B	34.59	< 33.39

6.4.2.2 Tolerance between 2 consecutive ladder sections

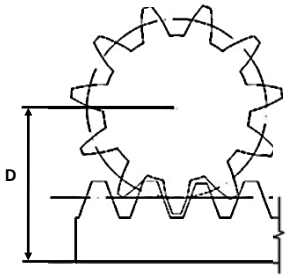
Using 2 calibrated rods of Ø 12 mm h6 check that the distance "C" between the dents of 2 consecutive ladder sections is between 48.7 and 50.7 mm.



DIMENSION	MINIMUM (mm)	MAXIMUM (mm)
C	48.7	50.7

6.4.2.3 Looseness limit:

To evaluate the looseness, check of control dimension "D" is between 57 and 58 mm. If "D" is not OK, the shafts of the counter guiding rollers need to be revised.

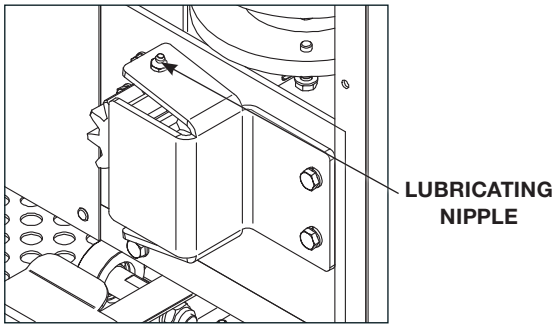


DIMENSION	MINIMUM (mm)	MAXIMUM (mm)
D	57	58

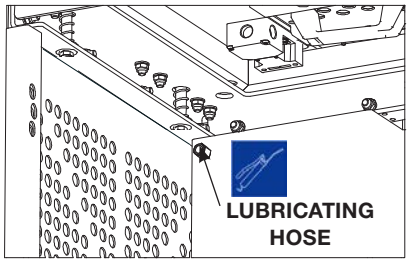
6.4.2.4 Lubricate the rack

Check that the lubricant on the rack and pinions is in proper conditions. If the lubricant is not in proper conditions, proceed as follows:

1. Place the lift at the bottom platform and disconnect the power supply.
2. Clean the old lubricant off the rack and pinions.
3. Use a grease gun and a zipper sleeve to lubricate the low pinion through the lubricating nipple.



4. Turn on the power supply and enter the lift.
5. Remove the female adaptor form the grease gun and connect the gun to the lubricating hose. Its location is indicated by means of a lubricating point sign.
6. Apply lubricant to the top pinion from inside the cabin throughout the ascent.
7. Repeat the lubrication throughout the descent.
8. If necessary, clean the excess of new lubricant off the rack.



The type of grease shall be KRAFFT KGP 2M or equivalent. For low temperature use LUBEKRAFTT KMG or equivalent.

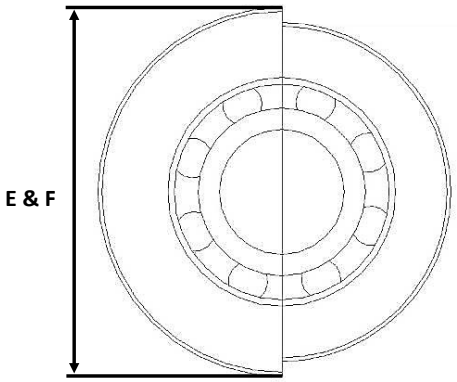
6.4.3 Guiding rollers and counter guiding rollers

Clean and lubricate the rack every time you replace a section of the ladder. If use is more severe, it will be necessary to lubricate more often.

1. Check that the outer surface of the rollers is uniform and free from damage.
2. Check that the control dimension "E" is between 48 and 50 mm on each counter guiding rollers.
3. Check that the control dimension "F" is between 46 and 50 mm on each guiding rollers.

DIMENSION	NEW COUNTER GUIDING ROLLER (mm)	REPLACEMENT CRITERIA (mm)
E	50	>48

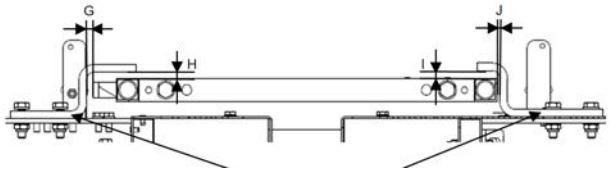
DIMENSION	NEW GUIDING ROLLER (mm)	REPLACEMENT CRITERIA (mm)
F	50	>46



6.4.4 Anti-derailment brackets

Check that the gaps between the anti-derailment brackets and the ladder stiles are within the ranges described in the following table.

DIMENSION	MINIMUM (mm)	MAXIMUM (mm)
G	7	9
H	6	8
I	6	10
J	3	4



Anti-derailment brackets

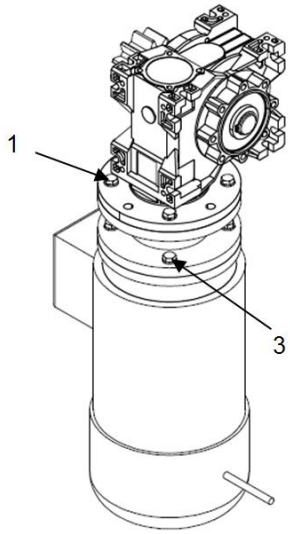
6.4.5 Torques assurance

All the screw connections listed in the following tables shall be marked to indicate their position once the final tightening torque is applied.

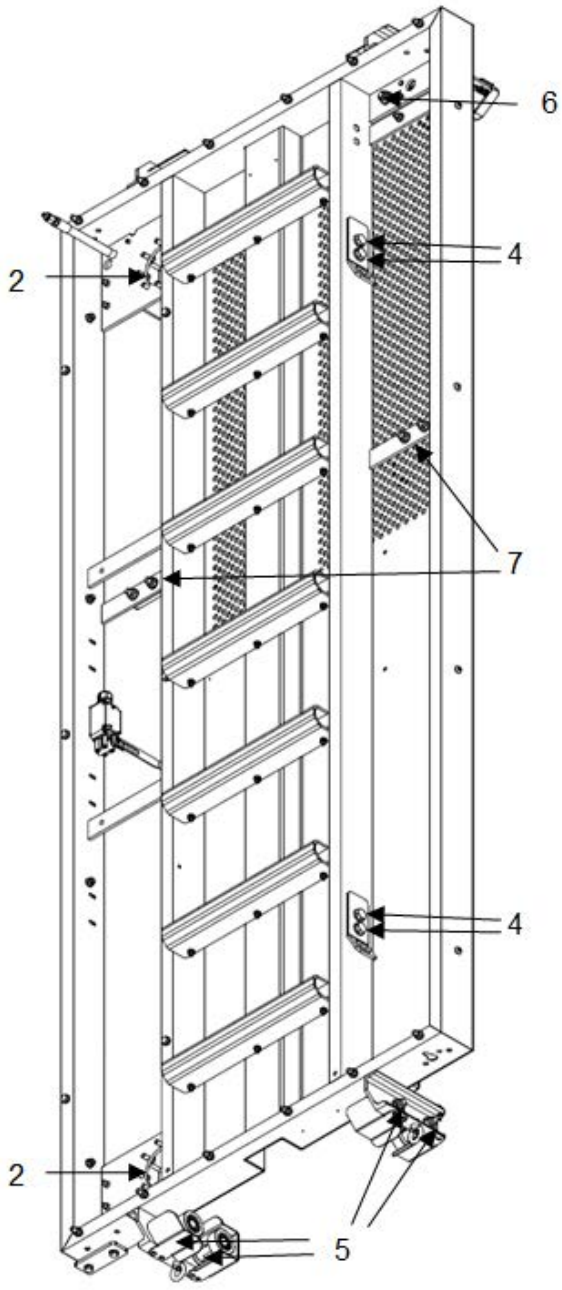
Check the tightening torque of all the screw connections, using an approved and calibrated torque wrench, in each of the following cases:
1. In the tower factory, during the assembly of the ladder section to the tower section.
2. On site, during the pre-commissioning, and in each annual inspection.

The correct tightening torque of each screw connection is listed the following tables.

Motor group:			TORQUE (N•m)	
JOINT		METRIC	ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
1	Gear box – Centrifugal brake	8	15	15
2	Motor group – Main structure	8	15	15
3	Motor – Centrifugal brake	8	15	15



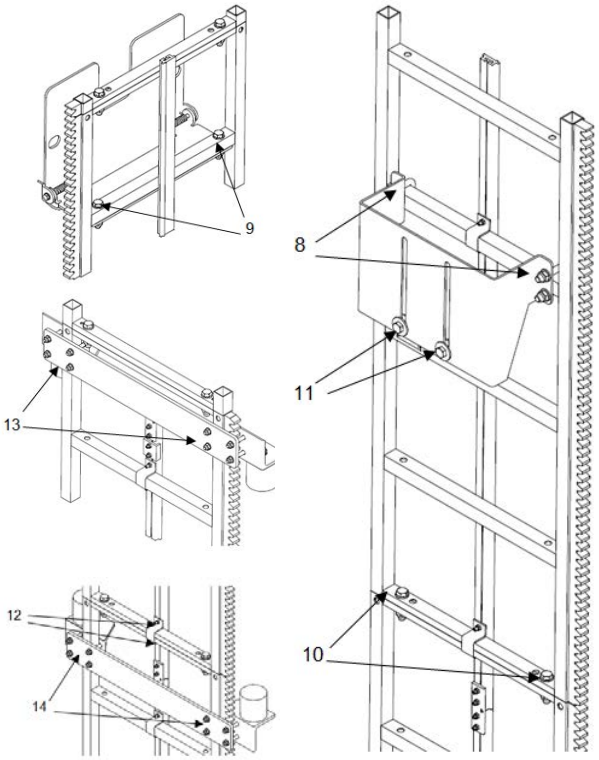
Cabin:			TORQUE (N•m)	
JOINT		METRIC	ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
4	Fall protection anchor point – Cabin	12	15	15
5	Roller shafts – Main structure	12	50	50
6	Counter roller guide shafts – Main structure	12	50	50
7	Anti-derailment brackets	10	30	30



CE AECO

[1)] *Mandatory for CE versions. Not applicable for AECO version.*

Ladder:			TORQUE (N•m)	
JOINT		METRIC	ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
8	Rung U-bolts	12	50	50
9	Rest platforms attachment	12	50	50
10	Ladder sections	12	50	50
11	Ladder anchor-ages – Tower brackets	12	50	12 for CE 50 for AECO
12	Rung fittings of safety rail	6	8	8
13	Ladder – Top mechanical stop	8	15	15
14	Ladder – Bottom mechanical stop	8	15	15



6.4.6 Overload limiter

1. Introduce 250 kg inside the cabin.
2. Press and hold the UP button. The lift shall ascend.
3. Introduce 25 kg more (275 kg in total) inside the cabin.
4. Press and hold the UP button. The lift shall not ascend, and the overload light (yellow) shall light up.
5. If any of the previous steps is unsatisfactory, readjust the overload limiter by following the instructions of the "Appendix A: Adjustment of the overload limiter".

6.4.7 Motor group

6.4.7.1 Gear box

1. Visually check for oil leaks. If an oil leak is found, AVANTI or qualified personnel authorised by AVANTI shall check that the gear box is proper conditions.
2. If needed, replace the gasket of the gear box cover, and re-fill with oil as needed.
3. Then close the cover of the gear box and apply the correct torque to the screws.

6.4.7.2 Centrifugal brakes

If the hour counter reads 90 h or more since the last inspection of the centrifugal brakes follow the steps below.

1. Open the motor cover.
2. Dismount the bottom motor from the centrifugal brake.
3. Extract the brake hub from the brake housing.
4. Replace brake linings if their thickness less than 1,5 mm.
5. Insert the brake hub back in the brake housing.
6. Mount the bottom motor on the centrifugal brake.
7. Repeat the previous steps with the top motor.
8. Close the motor cover.

Record the thickness measurings and the hour counter reading in the "Appendix C: Inspection log sheet". The detailed instructions of the adjustment of the motor brakes are available from AVANTI upon request.

This operation shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the centrifugal brake manufacturer instructions.

6.4.7.3 Electromagnetic brakes

The test and adjustment of the electromagnetic brakes shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the steps described in the "Appendix F: Test and adjustment of the electro-magnetic brakes".

6.4.8 Obstruction devices

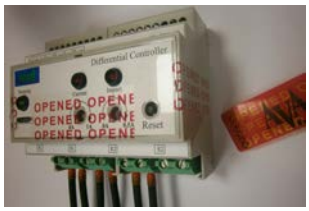
Clean and lubricate the guiding shafts of the top and bottom obstruction devices, in order to guarantee that the obstruction devices compress and decompress properly.

6.4.9 Differential controller [1)]

1. Open the cabin control box.
2. Check that the 3 sealing stickers of the differential controller have not been manipulated and that their serial numbers coincide with those written in the "Appendix C: Inspection log sheet".

If any of the sealing stickers has been manipulated, the differential controller needs to be adjusted.

Sealing sticker OK



Sealing sticker NOK

The detailed instructions of the adjutment of the differential controller are available from AVANTI upon request.

6.4.10 Bottom and top mechanical stops

1. Check that the bottom and top mechanical stops are not bent.
2. If the mechanical stops are bent, fix them, and revise the bottom, top and emergency limit switches thoroughly.

6.5 Ordering spare parts

Only original parts must be used. Spare parts list is available from AVANTI upon request.

CE AECO

[1)] *Not available for CE versions. Mandatory for AECO version.*

7. Troubleshooting

All tests and repairs to the electric components shall be performed by AVANTI or qualified personnel authorised by AVANTI.

Repairs to the motor group and to the system's supporting components shall be performed by AVANTI or qualified personnel authorised by AVANTI.

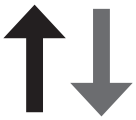
The wiring diagram is placed in the traction hoist's power cabinet.

If these steps do not identify the cause and rectify the fault: consult AVANTI or qualified personnel authorised by AVANTI.

Breakdown	Cause	Solution
The service lift cannot ascend nor descend. **DANGER!** *Attempting to use the lift will jeopardize work safety.*	**A1 The fixed EMERGENCY STOP button is activated.**	Turn this button clockwise until it moves out to deactivate it.
	A2 Rack or pinions are damaged.	a) Check the damage. b) Evacuate the cabin.
	A3 The service lift is stuck on an obstacle.	a) Remove the obstacle. b) Test the operational safety of affected tower sections. c) Inform the supervisor.
	A4 Power failure. a) Main switch is set to OFF. b) Grid voltage is interrupted. c) Supply between grid connection and control is interrupted.	a) Turn the main switch to ON. b) Find the cause and wait for the power to return. c) Test and if necessary repair the supply cable, fuses, and/ or wiring from the control box.
	A5 Two phases are changed in the supply.	Have AVANTI or qualified personnel authorised by AVANTI switch the two phases in the plug.
	A6 The hatches or door switches are triggered.	Check that door and hatches are properly closed.
	A7 Motor thermal protection.	a) Rearm. b) If repeated, contact AVANTI.
	A8 ELECTROMAGNETIC BRAKES do not open.	a) Check voltage to the electromagnetic brakes. b) Check the springs. c) Check the brake disc. d) Regulate the brake disc.
	A9 MAGNETIC THERMAL CONTROL.	a) Rearm. b) If repeated, contact AVANTI.
	A10 CONTROL DIFFERENTIAL.	a) Rearm. b) If repeated, contact AVANTI.
	A11 OVER VOLTAGE PROTECTION.	a) Rearm. b) If repeated, contact AVANTI.
	A12 EMERGENCY TOP AND BOTTOM LIMIT SWITCH is activated.	a) At top platform, perform manual descent until the switch is released. b) At bottom platform, disassemble the bottom plate safe zone until the switch is released. c) Check the position of the safe zone plates. d) Check the top and bottom mechanical stop position.
	A13 OVERLOAD (overload light illuminates).	a) Test and if possible reduce the load, until overload lights stops illuminating. b) If repeated, contact AVANTI.
	A14 (If trapped key system [1] is provided) the trapped key is not present or the trapped key switch is in the OFF position.	Insert the key and turn it to the ON position.
	A15 (If guard locking system [1] of fences is provided) the guard locking switch is defective.	Test / repair defective components.
	A16 (If the differential controller [2] is provided) the differential controller is tripped.	a) Open the cabin control box. b) If any of the red lights of the differential controller is lighted up, have AVANTI or qualified personnel authorised by AVANTI adjust the differential controller.

CE AECO

[1] Guard locking or trapped key systems are mandatory for CE full sliding door version. Not necessary for CE bucket type version. Mandatory for AECO version if send or call function is provided. [2] Not available for CE versions. Mandatory for AECO version.

Breakdown	Cause	Solution
The service can descend but cannot ascend.	**B1 The service lift is stuck under an obstacle.**	a) Carefully move the service lift downwards and remove the obstacle. b) Test the operational safety of the affected platform components. c) Inform the supervisor.
	B2 TOP OBSTRUCTION DEVICE is activated.	a) Check the springs. b) Move the lift down until the top obstruction switches are released.
	B3 INDUCTIVE SENSOR is activated.	a) Check section ladders. b) Check the status LED.
	B4 (If provided) Top limit switch [1] is activated. a) Top limit switch [1] is defective or not connected. b) Top limit switch [1] is activated.	a) Test the top limit switch [1] connection / function. Replace if necessary. b) Descend the service lift until the top limit switch [1] is released.
The service lift can ascend but cannot descend.	**C1 (If provided) Bottom limit switch [2] is:** a) defective. b) activated.	a) Test the bottom limit switch [2] connection / function. Replace if necessary. b) Ascend service lift until bottom limit switch [2] is released.
	C2 Bottom obstruction switches are: a) defective. b) activated.	a) Test the bottom obstruction switches connection / function. Replace if necessary. b) Ascend service lift until bottom obstruction switches are released.
	C3 The service lift is stuck on an obstacle.	a) Carefully move the service lift upwards and remove the obstacle. b) Test the operational safety of the affected platform components. c) Inform the supervisor.
 The service lift can ascend and descend but motor hums loudly.	**D1 Motor is damaged.**	Contact AVANTI.

8.Transport

The transport conditions shall be agreed with customer. If special transport requirements are needed, customer must specify them to AVANTI prior to delivery. The following conditions shall be considered.

8.1 Cabin

- Land transport: rear support over pallet, non-stackable. Dimensions: 3000 x 800 x 1200 mm.
- Sea transport: package using wooden box and plastic shrink on a pallet. Dimensions: 3000 x 800 x 1200 mm.

8.2 Installation accessories

The installation accessories other than mast sections (rest platforms, power cable, etc.) are supplied on a European pallet.

8.3 Mast sections

Mast sections are supplied on a pallet. Dimensions: 1500 x 800 x 1000 mm.

9. Delivery inspection

Check the delivery against shipping lists and look for transport damages. Should there be any damage, report it to the responsible transport insurance company within 24 hours from the date of arrival of the goods.

Other claims should be made to AVANTI representative within the same period.

10. Storage

The storage conditions shall be agreed with customer. If special storage requirements are needed, customer shall specify them to AVANTI prior to delivery. The following conditions shall be considered.

10.1 Before installation of service lift on WTG tower section

Keep the service lift in its original packaging until it is mounted on the WTG tower section.
Avoid direct contact of package with floor by placing a pallet under it. Position the pallet on a stable ground.
Store the service lift in a dry place and protected from rain (i.e. in roofed areas). In corrosive environments (i.e. near the sea or in foggy places) store indoors.
Store in a clean and ventilated place, free of negative influences of chemical and water vapours or other corrosive substances.
Store between -30ºC and 80ºC (survival temperature). If possible, avoid sudden temperature changes.
Handle the service lift with care and store in a safe place in order to avoid unintended damages.
Do not stack.
Should any of these conditions not be maintained, the service lift could be spoilt with dirt or other substances, which could start corrosion before even the service lift is put into operation.
Store the package so that its labelling is clearly readable.

10.2 After installation of service lift on WTG tower section

After installing the service lift in the WTG tower section, confirm that the service lift is properly attached to the ladder (i.e. pinions are engaged with rack, and rollers and anti-derailment brackets are mounted).
Close top and bottom holes of WTG tower sections with covers to prevent water entry.

10.3 During WTG tower erection

During the erection of the WTG tower sections, and while there is risk of rain entry, protect the service lift with wrapping film to prevent water entry.
If WTG tower erection is left uncompleted, close the top hole of the WTG tower section with a cover.
In case that the inside of the WTG tower sections is washed, protect the service lift with wrapping film to prevent water entry.

10.4 After service lift is put into service

If the service lift is not going to be used for a long period of time:

- Clean all the parts of the service lift using non-abrasive brushes.
- Clean the pinions and racks thoroughly and grease them to prevent corrosion.

Before using the service lift, if it has not been used for a long period of time:

- Clean all the parts of the service lift of accumulated dust.
- Grease the shafts, pinions and rack.

11. Installation

11.1 WTG requirements

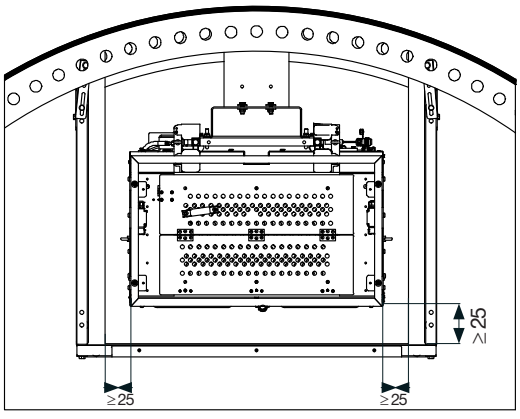
The following information is necessary for the correct integration of the service lift inside a wind turbine tower.

11.1.1 Height and angle

The service lift can be installed on towers up to 150 m high, and with a maximum inclination angle to the ladder axis of ±2º and of ±0,5º for every 3 m of ladder.

11.1.2 Lift holes at platforms and air gap to tower parts

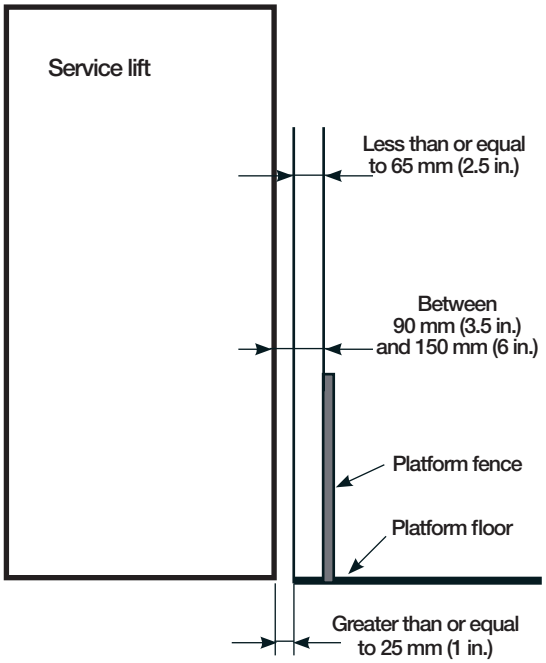
The service lift must have an air gap of at least 25 mm around it along the tower to avoid collision with tower components and to avoid finger trapping. The wind tower manufacturer must verify this as part of the integration process not only in the static position but also considering possible movement of components inside the tower as a consequence of the tower sway.



CE AECO

[1] Optional for CE versions. Mandatory for AECO version.
[2] Not available for CE versions. Optional for AECO version.

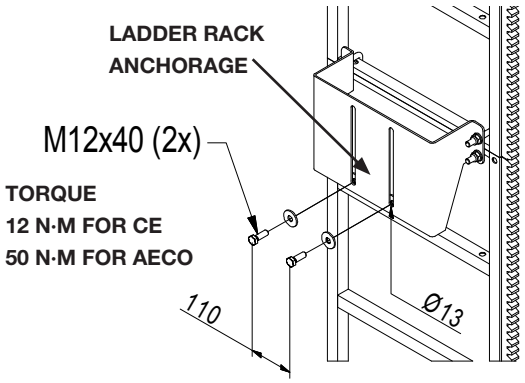
The gaps on the loading side of the service lift shall conform to applicable requirements of 5.11 of ASME A17.1-2013/CSA B44-13 [1].


Service lift
Less than or equal to 65 mm (2.5 in.)
Between 90 mm (3.5 in.) and 150 mm (6 in.)
Platform fence
Platform floor
Greater than or equal to 25 mm (1 in.)

The components subjected to possible movement inside the tower may include, but are not limited to, dampers, cables, doors, hatches, etc. The service lift needs a gap of 500mm below the lowest landing area to accommodate the bottom buffers.

11.1.3 Tower support brackets

The ladder rack is attached to the tower structure at a distance of max 3000 mm. The tower support brackets must be so designed that the ladder rack anchorages can be mounted. The connection between the tower support brackets and the ladder rack anchorages is done with M12 bolts A2-70 tighten with a torque of 50 N·m in the tower factory but with a torque of 12 N·m for CE (50 N·m for AECO) on site once the tower has been erected and before the cabin is going up. Reaction forces on connection bolts must be considered in the design of the tower brackets. This information may vary with the installation characteristics. Contact AVANTI to get the information.



11.1.4 WTG electrical supply requirements

Electrical supply requirements		
Version	**CE**	**AECO**
Power Supply Type	3 Phase +PE + N	3 Phase + PE
Voltage	400 V ± 5 %	400 V ± 5 %
Frequency	50 / 60 Hz	60 Hz
Fuses	16 A	16 A
Protection	Acc. To EN 60204 - 1	UL 508A

11.1.5 Other requirements

The WTG manufacturer must provide any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI´s scope.

11.2 Cautions on site

All installation process must be made according to the installation drawing supplied by AVANTI.

Prior to installation, check the instructions and drawings.

Prior to installation, ensure that building sections involved will be able to withstand the service lift loads.

Prior to installation, ensure that all necessary parts and tools are available and fully functional.

Prior to installation, ensure that platform holes are protected with fences.

Wear PPE for protection against falls if falling height is higher than 2 m.

Installation shall be performed by AVANTI or qualified personnel authorised by AVANTI.

The customer must define the maximum allowable wind speed ensuring safe installation.

At the end of the workday security measures must be taken to put the elevator out of service and make the ladder accessible. Place a warning sign: SERVICE LIFT OUT OF SERVICE. DO NOT USE

CE AECO

[1] *Optional for CE versions. Mandatory for AECO version.*

11.3 Assembly in tower factory

11.3.1 Top tower section

1. Install and adjust upper ladder section at the top of the top tower section (see Fig. 1 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.

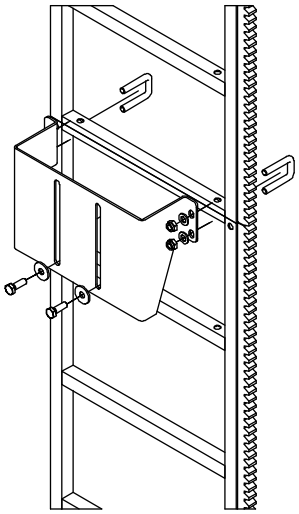


Fig. 1

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

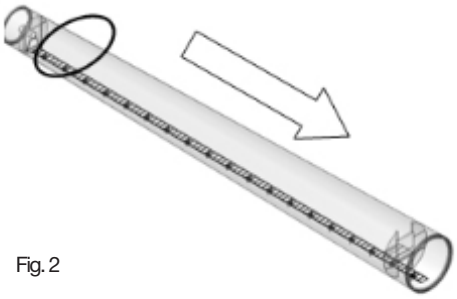


Fig. 2

3. I)
m (see Fig. 3 and installation drawing).

Fig. 3

4. Install the top mechanical stops and the top limit plate (see Fig. 4 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.

Fig. 4

11.3.2 Intermediate tower sections

1. Install and adjust upper ladder section at the top of the intermediate tower section (see Fig. 1 and installation drawing).

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

4. Install the electric cable arm support (see Fig. 5 and installation drawing).

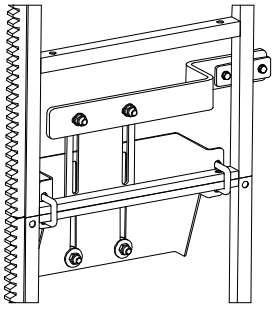


Fig. 5

5. (If platform switch [1)] on service lift is provided) install a safe zone plate on the ladder at each platform.

11.3.3 Bottom tower section

1. Install and adjust upper ladder section at the top of the bottom tower section (see Fig. 1 and installation drawing).

CE AECO

[1)] Optional for CE bucket type version. Mandatory for CE full sliding door version. Optional for AECO version.

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

4. Position the cabin inside the bottom tower section ensuring that bottom guiding rollers are aligned with a ladder support (see Fig. 6).

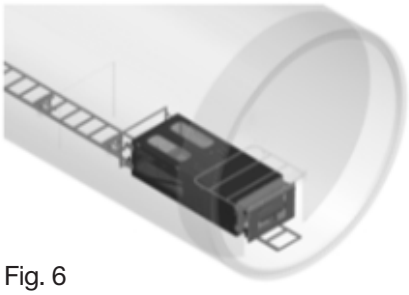


Fig. 6

STOP *Mount the guiding rollers shafts into the correct holes: green shafts into green coloured holes and orange shafts into orange coloured holes.*

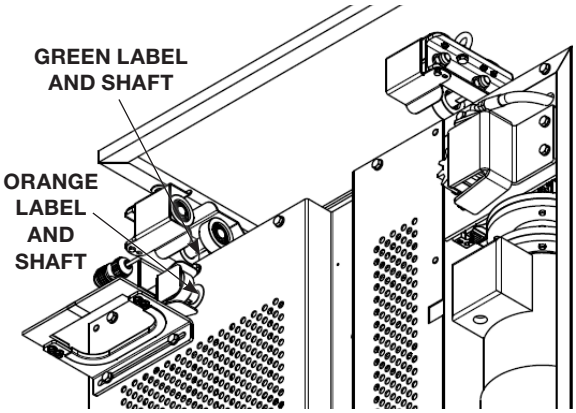


Fig. 7

5. Install the bottom mechanical stop and the bottom limit plate (see Fig. 8 and installation drawing).

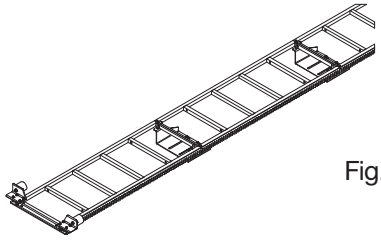


Fig. 8

It is also possible to install the cabin and bottom mechanical stop on site.

Service lift can be used during installation.

11.4 Assembly on site

After the tower sections are erected:

1. Climb up to the second tower flange.
2. While descending to the previous tower flange, loosen connection bolts between the ladder rack anchorages from the tower support brackets.
3. Lower down the loose ladder section until it contacts the previous ladder section, so that no gap exists.
4. Tighten the connection bolts between the ladder sections (see Fig. 9).

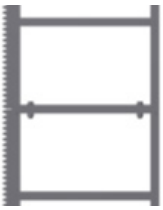
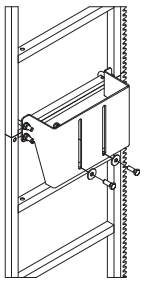


Fig. 9

5. Using two calibrated rods of Ø 12 mm check that distance between ladder sections dents is 49.7 ± 1 mm.

6. While climbing up, tighten the connecting screw (M12) between the ladder rack anchorages and tower support brackets with a torque of 12 N·m for CE (50 N·m for AECO) (see Fig.10).



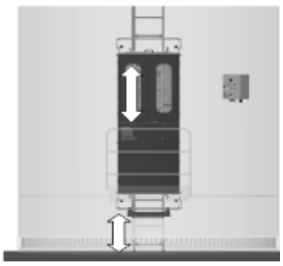
STOP *Check that the gap between each connecting screw (M12) and the top end of its corresponding oblong hole is at least 5 mm.*

Fig. 10

7. Climb up to next tower flange and repeat actions 2 to 5 until there are no gaps between the ladder sections.

8. Check that gap between anti-derailment bracket and ladder stile is 4 mm.

Fig. 11



9. With the service lift at bottom platform:
9.1. For bucket type [1]: adjust the bottom mechanical stop so that it is possible to open the double door just above the fence railing. The service lift must stop when obstruction device reaches the bottom mechanical stop (see Fig. 11).

9.2. For full sliding door without bottom limit switch configuration [2]: adjust bottom mechanical stop so that cabin floor is lined up with platform floor.

9.3 For full sliding door with bottom limit switch configuration [3]: adjust bottom limit plate so that cabin floor is aligned with platform floor.

CE AECO

[1] Applicable to CE bucket type version.
[2] Applicable to CE full sliding door version. Optional for AECO version.
[3] Optional for AECO version.

11.5 Electrical connections on site

Electrical connections must be made in accordance with EN 60204-1 for CE versions and in accordance with UL 508A for AECO version.

1. Install the top and bottom platform control boxes and connect the cable connections and the electrical boxes.

2. Use cable ties to attach the fixed cable to the tower internal (see Fig. 12).

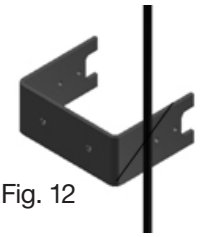
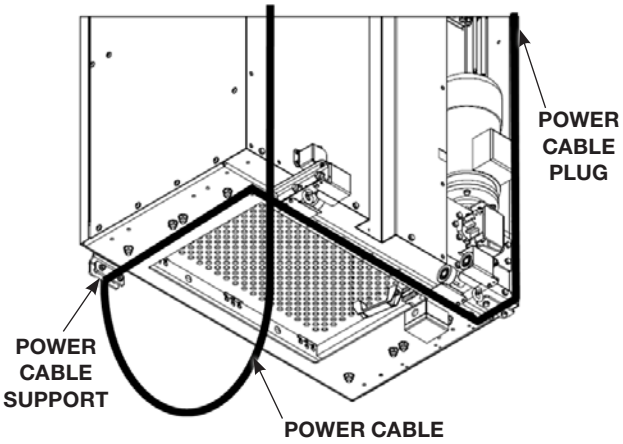


Fig. 12

3. Conect power supply cable.



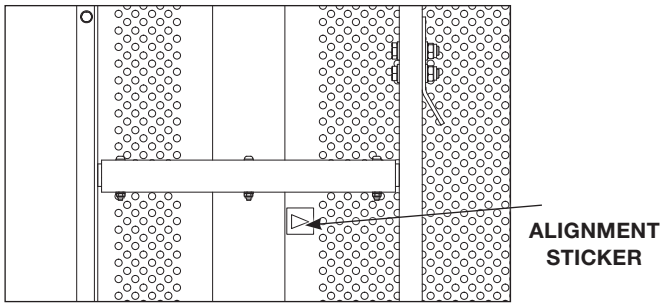
11.6 Differential controller [1)]

The differential controller is already mounted inside the cabin control box.

The detailed instructions of the adjustment of the differential controller are available from AVANTI upon request.

11.7 Alignment stickers installation

1. Stick the alignment sticker inside the cabin next to the grid of holes at a height of 1,5 m from cabin floor.



2. There is an alignment sticker for each tower platform. Stick the sticker on right ladder stile at a height of 1,5 m from each platform, and with triangle pointing to the left.

3. For top platform, and for ring shape platforms, stick the sticker on right ladder stile at 0,9 m under each platform, and with triangle pointing to the left.

11.8 Two runs without grease on the rack

1. Once the installation is complete, and before applying the grease on the rack, ascend and descend the service lift along the complete travel path two times. This way, any metal swarfs coming from the galvanised rack will be removed.

2. Remove the pinion covers and clean off the metal swarfs.

3. Put back the pinion covers.

4. Grease the rack.

12. Disassembling

The disassembling shall be done following the installation instructions but in reverse order.

The disposal shall be done in accordance with local authority regulations.

[1)] Not available for CE versions. Mandatory for AECO version.

13. Inspection before first use

An inspection shall be carried out before the first use of the service lift.

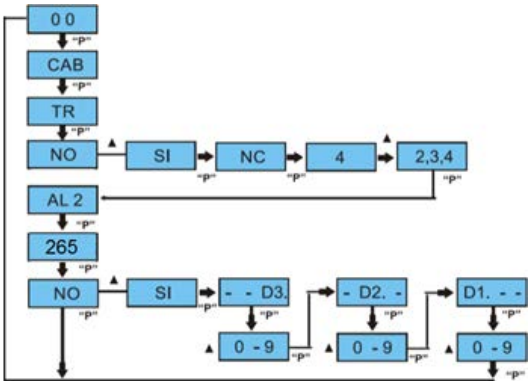
The inspection before first use shall only be performed by AVANTI or by qualified personnel authorised by AVANTI.

The inspection before first use shall be performed following the instructions of chapter “6.4 Annual inspection”, and filling in the “Appendix B: Inspection checklist” and the “Appendix C: Inspection log sheet” for future possible reference.

Appendix A: Adjustment of the overload limiter

The adjustment of the overload limiter shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the steps described below.

A.1 Workflow



A.2 Buttons

The “P” button is used to confirm the value and to continue to the next step.
The “UP Arrow” button is used to change the value of a parameter.

“P” button “UP Arrow” button

A.3 Instructions

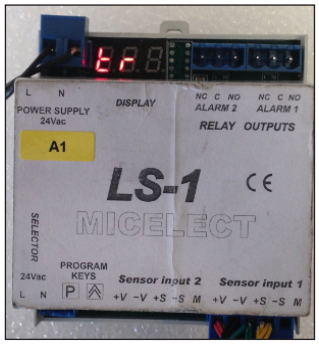
1. Switch ON the lift and open the cabin control box.
The display shows “0 0”.

2. Press and hold the “P” button for 2 or 3 seconds until the display shows “CAb”.

3. Press the “P” button.
The display shows “tr”.

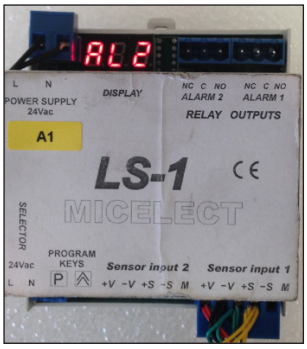
4. Press the “P” button.
The display shows “NO”.

5. Press the “UP Arrow” button.
The display shows “SI”.



6. Press the “P” button.
The display shows “SI”.
It is flashing.
You have 10 seconds to get out the lift.
Then the lift measures the weight of the empty cabin.

7. Once the “no load” setting is set, the display shows “NC” which means “number of cells”.



8. Press the “P” button.
The display should show “4”.
(Informational note: this value should be set 4 from factory.)
8.1 If the display shows “4”, press the “P” button to confirm.
8.2 If the display shows a value different to “4”, correct it by pressing the “UP Arrow” button and finally confirm by pressing the “P” button.

9. The display shows “AL2”, which is the top overload limit to be set.

10. Press the “P” button.
The display shows the triggering limit of the overload limiter.
It must be 265 kg.
10.1 If the display shows “265”, press the “P” button.
The display shows “NO”.
Finally, press the “P” button.
The display shows “0 0”.
The process is finished.
10.2 If the display does not show “265”, press the “P” button.
The display shows “NO”.
10.2.1 Press the “UP Arrow” button.
The display shows “SI”.
10.2.2 Press the “P” button.
The display shows a dot next to the third digit.
10.2.3 Press the “UP Arrow” button to modify the value of the third digit as needed.
10.2.4 Press the “P” button.
The display shows a dot next to the second digit.
10.2.5 Press the “UP Arrow” button to modify the value of the second digit as needed.
10.2.6 Press the “P” button.
The display shows a dot next to the first digit.
10.2.7 Press the “UP Arrow” button to modify the value of the first digit as needed.
10.2.8 Finally, press the “P” button.
The display shows “0 0”.
The process is finished.

Appendix B: Inspection checklist

Date:		**Serial nº traction system:**	
Name of competent:		**Serial nº traction system 2:**	
Lift nº:		**Tower nº:**	
Total hours of operation:		**Address of installation:**	
Serial nº ladder rack:			

1	TRAVEL ZONE	OK	Not OK	ISSUE DESCRIPTION
1.1	Is the travel zone clear of obstacles?			
2	**CONTROL & SAFETY DEVICES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
2.1	Is the cabin control box without dents, cracks and disparities?			
2.2	Do the buttons of the cabin control box function properly?			
2.3	Does the ready lamp (green) function properly?			
2.4	Do the UP/DOWN lights (green) of the platform control boxes light up when lift ascends/descends respectively?			
2.5	Do all emergency stop buttons interrupt lift control when activated?			
2.6	Do the bottom obstruction switches interrupt descent when activated?			
2.7	Do the top obstruction switches interrupt ascent when activated?			
2.8	(If provided) Does the top floating frame switch sit and function properly?			
2.9	(If provided) Does the bottom limit switch sit and function properly?			
2.10	(If provided) Does the top limit switch (S1) sit and function properly?			
2.11	Does the emergency top and bottom limit switch (S13) function properly? Is it properly adjusted at top and bottom platforms?			
2.12	Does the bottom cabin hatch switch sit and function properly?			
2.13	Does the bottom obstruction hatch switch sit and function properly?			
2.14	Does the top hatch switch sit and function properly?			
2.15	Does the fault light (red) light up when a safety switch is triggered? (Verify with all the switches.)			
2.16	Does the fault light (red) light up when an emergency stop button is triggered?			
2.17	(If provided) Does the platform light (green) light up when the service lift is at a platform?			
2.18	(If provided) Does the platform switch (S18) sit and function properly?			
2.19	(If provided) Does the door switch sit and function properly?			
2.20	(If provided) Does the door guard locking switch (S19.3) sit and function properly?			
2.21	Are the anti-derailment brackets properly installed and tightened?			
2.22	(If provided) Do the send and call buttons of the bottom platform control box respond with a delay when actuated? Does the buzzer from the cabin control box sound during this			
2.23	(Not applicable to the daily inspection) When the inductive sensor is distanced more than 7 mm from the ladder stile, does it interrupt control and does the light (red) of the inductive			
2.24	(Not applicable to the daily inspection) When the inductive sensor is distanced between 4 and 7 mm from the ladder stile, does it enable control and does the light (red) of the			
2.25	(Not applicable to the daily inspection) Is the gap between the inductive sensor and the ladder stile between 4 and 7 mm?			
3	**CABIN**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
3.1	Is the cabin free of cracks, dents and disparities?			
3.2	Is the cabin clean and in overall good condition?			
3.3	Are all the assembling screws of the cabin properly mounted and tightened?			
3.4	Does the bottom obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated?			
3.5	Does the top obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated?			
3.6	Are the anchor points free of cracks and dents? Do they have no permanent deformation? Are their screws properly tightened?			
3.7	Are the steps and handles properly placed? Are their screws properly tightened?			
3.8	(Not applicable to the daily inspection) Is the cabin free of damages and cracks after performing the dynamic test on the electromagnetic brakes?			
4	**GUIDING SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
4.1	Is the outer surface of the guiding rollers uniform and free of damage?			
4.2	Is the wear of the surface of the guiding rollers less than 2 mm?			
4.3	Is the wear of the surface of the counter guiding rollers less than 1 mm?			

4.4	Are the guiding rollers properly installed?			
4.5	Is the guiding ladder free of damage and properly installed?			
4.6	Are the connecting screws between the ladder sections properly tightened?			
4.7	Are the connecting screws between the ladder sections and the ladder rack anchorages properly tightened?			
4.8	Is the rack of each ladder section free of damages and within allowed wear limits?			
4.9	Is the rack properly lubricated?			
4.10	Are the connecting screws between the ladder anchorage and the tower support brackets properly tightened?			
4.11	(Only applicable to the inspection before the first use) Is the distance between the rack dents of 2 consecutive ladder sections between 48.70 and 50.70 mm?			
4.12	Are the ladder anchorages free of damages (e.g. cracks)?			
4.13	Are the rest platforms properly installed and free of damages? Do they unfold automatically?			
4.14	Is the gap between each connecting screw (M12) and the top end of its corresponding oblong hole at least 5 mm?			
5	**DOORS AND HATCHES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
5.1	Do the bottom and top hatches open and close properly?			
5.2	Is the door properly mounted and tightened to the cabin?			
5.3	Does the door open and close smoothly?			
6	**ELECTRICAL SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
6.1	Are all the electrical cables free of squeeze marks? Are their isolations present and free of damages?			
6.2	Are the electrical cables laid and fixed with cable ties ensuring that there is no slack?			
6.3	Is the sealing of the control boxes in order?			
6.4	(If provided) Is the travelling cable free of squeeze marks? Is the isolation of the cable present and free of damages?			
6.5	(If provided) Is the hanging cable free of squeeze marks? Is the isolation of the cable present and free of damages?			
6.6	Are all the electrical plugs correctly mounted and connected? Are the plugs free of dents, cracks, disparities and loose screws?			
6.7	(If provided) Is the mid tower electrical cable support properly installed and tightened?			
6.8	Is the bottom platform control box free of damages?			
6.9	Is the mid tower junction box free of damages?			
6.10	Is the top platform control box free of damages?			
7	**ELECTRONIC SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
7.1	(If provided) Are the 3 sealing stickers of the differential controller not manipulated?			
7.2	(If provided) Do the serial numbers of the 3 sealing stickers coincide with those written in the "Appendix C: Inspection log sheet"?			
7.3	(If provided) Does the differential controller function properly? (Perform the functionality tests.)			
8	**TRACTION SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
8.1	Are the 4 fixing bolts, the washers and the nuts present? Are they tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
8.2	Is there no trace of oil leak around motor and gearbox?			
8.3	Are the motor groups free of damages?			
8.4	Are the motor groups properly installed and tightened to the main structure?			
8.5	Does the manual descent system function when activated?			
8.6	Do the motors sound normal during travel?			
8.7	Is each electromagnetic brake able to stop and hold the service lift when the dynamic test is performed? (See "Appendix G: Test and adjustment of the electromagnetic brakes).			
8.8	Are the pinions free of damages and within allowed wear limit?			
8.9	(If the hour counter reads 90 hours or more since the last inspection of the centrifugal brakes) Is the thickness of the brake linings more than 1,5 mm?			
9	**OVERLOAD LIMITER**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
9.1	Does the overload limiter NOT trigger when the lift is loaded with 250 kg? If it does trigger, adjust it as described in "Appendix A: Adjustment of the overload limiter".			
9.2	Does the overload limiter trigger and does the overload light (yellow) light up when the lift is loaded with 275 kg? If not, adjust it as described in "Appendix A: Adjustment of the overload limiter".			

10	TRAPPED KEY SYSTEM	OK	Not OK	ISSUE DESCRIPTION
10.1	(If provided) Is the trapped key properly secured to the cabin with a chain or wire rope?			
10.2	(If provided) Is the trapped key lock properly tightened to the platform fence? Is it fully functional?			
10.3	(If provided) Is the trapped key switch of the cabin control box fully functional?			
11	**GUARD LOCKING SYSTEM OF THE PLATFORM FENCE DOOR**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
11.1	(If provided) Is the guard locking lock properly tightened? Does it function properly?			
11.2	(If provided) Is the guard locking switch of the platform fence door properly adjusted and tightened?			
12	**PLATFORMS**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
12.1	Does the service lift pass freely through all platform openings without hitting the WTG flanges, platform floors and platform fences?			
12.2	Do the platform fences fulfil specifications for proper mounting?			
12.3	Are the bolts of platform fences properly tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
12.4	Are the call controls of top and bottom platform control boxes fully functional?			
12.5	(If provided) Are the send controls of top and bottom platform control boxes fully functional?			
12.6	Are the bottom and top mechanical stops properly installed and tightened?			
12.7	Are the bottom and top limit plates properly installed and tightened?			
12.8	(If provided) Are the safe zone plates properly installed and tightened?			
13	**INFORMATION SIGNS AND DOCUMENTS**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
13.1	Are all the information signs and documents present and legible? (For example: Max. load and PPE stickers.)			
13.2	(If provided) Are the alignment stickers present on each platform and inside the cabin? Are they installed so that lift stops aligned to each of the platforms?			
14	**FINAL ASSESSMENT**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
14.1	Is the service lift installation in overall good operational condition?			Name of competent(s) in capital letters:
				Signature of competent(s):

Competent inspection may only be performed by AVANTI or qualified personnel authorised by AVANTI.

Every 12 months competent inspection has to be carried out, and the "Appendix B: Inspection checklist" and the "Appendix C: Inspection log sheet" must be completed for possible future reference.

Appendix C: Inspection log sheet

Date & time	TYPE OF INSPECTION (BEFORE FIRST USE, ANNUAL OR UNSCHEDULED)	OVERALL RESULT		HOUR COUNTER	ISSUE DESCRIPTION & COMMENTS	NAME (IN CAPITAL LETTERS) & SIGNATURE OF COMPETENT
		OK	NOT OK			

Appendix D: AVANTI lift anchor point

D.1 Caution

AVANTI LIFT ANCHOR POINT is an anchor point used for protection against falls from heights intended for use with a full body harness approved according to EN 361 or Z359.1:2007 as applicable. Connection to the LIFT ANCHOR POINT is only allowed by using self-closing connectors according to EN 362 or Z359.1:2007 as applicable.

Use in connection with other equipment than specified, may be potentially dangerous. User shall be equipped with a means of limiting the maximum dynamic forces exerted on the user during the arrest of a fall to a maximum of 6kN. In case of doubt, please contact AVANTI.

The maximum load that can be transmitted in service from the anchor device to the structure is 22.2 kN in ±15° vertical direction. The maximum deflection of the anchor point that can occur in service is 10mm.

AVANTI LIFT ANCHOR POINT is tested and approved only to be mounted on AVANTI lifts. This manual always needs to be represented in language of sale and provided for use by all technicians. Activities at height are dangerous and may lead to severe injury or even death.

Gaining an adequate apprenticeship in appropriate techniques and methods of protection is important and is your own responsibility.

Users are obliged to read and understand this User Manual. Further they need to be proper equipped and instructed with the use of the necessary fall arrest equipment and emergency procedures in case of injury or sudden illness.

Users going to install AVANTI LIFT ANCHOR POINT need to be familiar with the installation section of this manual. It's essential to the safety, that the user always attach the energy absorber as high as possible above his/her position, to minimize the fall distance most possible in case of a fall.

The position of the anchor point is crucial for fall arrest – the height of the fall, elongation of lanyard and energy absorber or pendulum movement of the user should be considered in order to minimize the risk of impact in obstacles in case of a fall. It's prohibited for the user to do many modifications or use non original Avanti components when assembling AVANTI LIFT ANCHOR POINT.

Re-use of demounted AVANTI LIFT ANCHOR POINTS or parts is not allowed. Any changes or other uses beyond this manual are strictly forbidden.

Any changes or other uses beyond this manual are strictly forbidden. This documentation must be kept in the service lift for the purpose of subsequent examinations of the anchor device.

D.2 Danger

The AVANTI LIFT ANCHOR POINT is for the use of one person only. It is strictly forbidden to carry out work if the person is in unfit mental or physical condition. Climbing and working under the influence of alcohol, drugs or any medication which can interfere with the safety are also much prohibited.

If there are any doubts to the safety of the AVANTI LIFT ANCHOR POINT, or it isn't proper fixed, deform or damaged with cracks or similar incompatible harms it may never be used – Please contact the manufacture immediately. In case of corrosion the anchor immediately needs to be removed.

Observations:
Only to be used by instructed workers! Instructed workers must be aware, instructed and prepared to utilize site rescue plans.

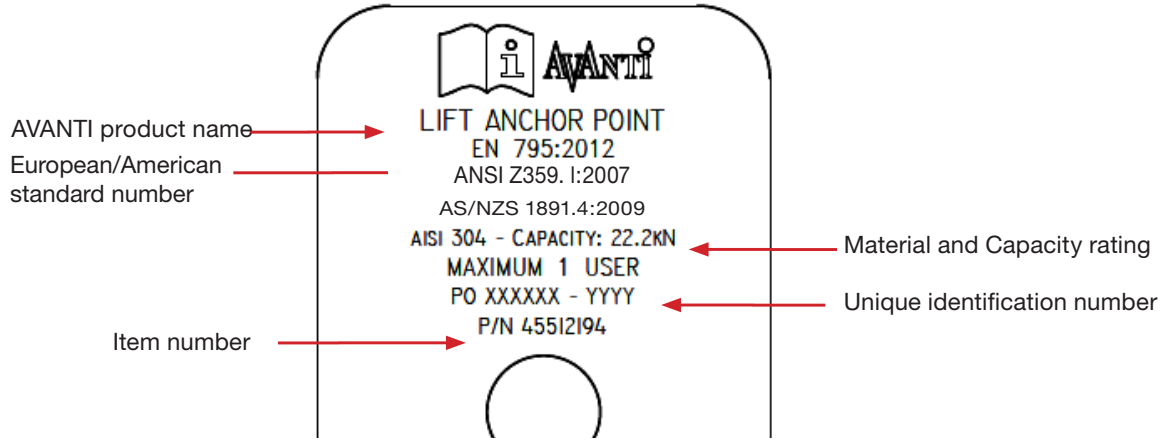
Only to be used for preventing vertical fall!

Only to be used for fall arrest, not to hoist or hang in goods or similar! Before attaching in the ANCHOR POINT the user needs to check it is sitting fixed and screws are sitting tight and proper.

If AVANTI LIFT ANCHOR POINT has arrested a fall it may never be used again. Part must be removed from service immediately.

D.3 Marking

Marking on Lift Anchor point plate:



After installation, marking shall be completely accessible; otherwise additional marking near the anchor device will be necessary.

D.4 Installation

The installation must be performed by a competent person following the instructions of this manual.

AVANTI LIFT ANCHOR POINT is tested and approved only to be installed on AVANTI lift. AVANTI LIFT ANCHOR POINT made from AISI 304 Steel has to be screwed with two bolts DIN 933 A2-70 M12 mm, 4 washers DIN 125A A4 and self locking nuts DIN 985 A4 M12. In case of doubt, please contact AVANTI.

Before installing the AVANTI LIFT ANCHOR POINT in heights, assure to be proper secured against fall from height by using relevant fall arrest equipment.

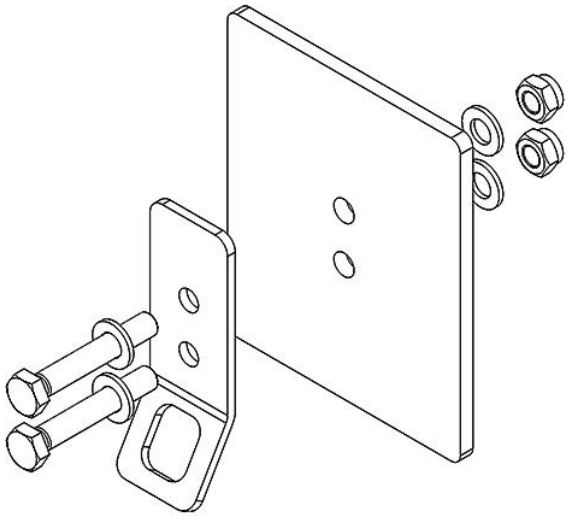
AVANTI LIFT ANCHOR POINT:

1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.

2. Torque the nuts with 15 N·m (11 lb·ft).

3. Make sure the Anchor is fully seated and properly tightened.

4. Carry out the annual inspection by following the instructions of “D.5 Inspection” and filling in the “D.6 Inspection checklist” and the “D.7 Inspection log sheet” for future reference.



D.5 Inspection

After installation:
An inspection must be carried out by a competent person following the inspection form in this manual.

Before use:
Each time using the AVANTI LIFT ANCHOR POINT the user inspects the ANCHOR visual and manually by twisting / pulling. Check the parts are properly fixed and free of deformities, damages, cracks or similar unacceptable defects.

Periodical examination:
A periodic examination at least every 12 month is essential for the safety of the AVANTI LIFT ANCHOR POINT. The examination must be performed by a competent person following the inspection form in this manual.

For the AVANTI LIFT ANCHOR POINT the competent person (authorized in writing by AVANTI) only needs to be trained in any metallic component covered by the European/American standard norms for fall arrest equipment.

D.6 Inspection checklist

PPE Anchor:	Manufacturer:	Avanti
	Type / Model:	Lift Anchor Point
	Identification no.:	
Fixing structure:	Lift serial no.:	
	Lift model:	
	Wind farm / WTG no.:	
Installed by:		
Installation company:		

	OK	**not OK**
1. Lift structure does not show any deterioration.		
2. Anchor Point locking screws are fully inserted and tightened with 15 N·m.		
3. Anchor Point does not show cracks, deformities, corrosion or other damages.		
4. Anchor Point installed on the lift structure according to the instructions.		
5. Anchor Point marking is clearly readable.		

Is the Anchor Point in good condition to be used?

Yes	Needs Repair	Replace

Signature of competent:
Name of competent in capital letters:
Date:

If the AVANTI LIFT ANCHOR POINT is found not OK, it must be removed / replaced by a new AVANTI LIFT ANCHOR POINT!
The result of the periodic examination must be recorded in the Registration form of anchor.

D.7 Inspection log sheet

Avanti lift Anchor Point	**Identification no.:**	Avanti Wind Systems A/S DK-3400 Hillerød Tel:+45 48 24 90 24 Fax: +45 48 24 91 24 www.avanti-online.com

Date of purchase:	**Date first put into service:**

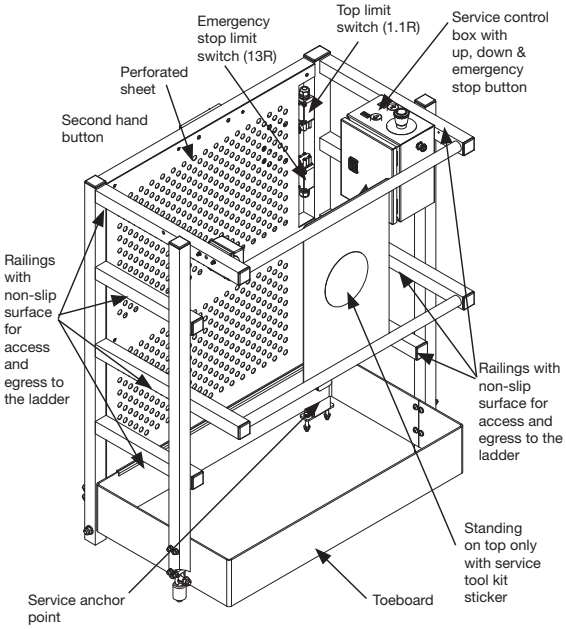
Periodic examination and repair history				
Date	**Reason for entry (per. exam)**	**OK / not OK**	**Inspector**	**Periodic exam next due date**

Appendix E: Service tool kit [1)]

E.1 Description

The service tool kit is an optional portable tool that allows a user to ride on top of the service lift in order to perform installation and service tasks along the travel zone:

- During erection of WTG: installing WTG power supply and auxiliary cables running close to the lift.
- Maintenance: tightening and verifying torque of WTG flange bolts.
- Repair: replacing components which are accessible from the lift: lights, junction boxes and cables.


Emergency stop limit switch (13R)
Top limit switch (1.1R)
Service control box with up, down & emergency stop button
Perforated sheet
Second hand button
Railings with non-slip surface for access and egress to the ladder
Railings with non-slip surface for access and egress to the ladder
Standing on top only with service tool kit sticker
Service anchor point
Toeboard

1. When STK is mounted on lift:
- the top obstruction device (roof) is compressed and therefore activated; consequently control is interrupted.

2. When STK is mounted on lift and service control box is connected:
- the controls of cabin control box and platform control boxes are overridden, but
- the controls of service control box are still not operational.

3. When STK is mounted on lift, service control box is connected, NORMAL/SERVICE selector of cabin control box is turned to SERVICE position, and MANUAL/AUTO selector 2) is turned to AUTO position:
- the controls of cabin control box and platform control boxes are overridden,
- the controls of service control box are operational, and
- the rated load inside the cabin is decreased from 240 kg to 30 kg. This way it is not possible to travel inside the cabin when STK is installed.

The connection of the service control box does not override any safety: if any hatch, door or limit switch, or emergency stop button, is activated, no travel will be possible. There are three controls available on the service control box: UP and DOWN buttons and an emergency stop button. Horizontal railings have non-slip surface.

E.2 Technical specifications

Service tool kit	
Service tool kit weight	<25 kg
Rated load inside the cabin when service tool kit installed	30 kg
Max. n° persons inside the cabin	0 person
Max. n° persons on service tool kit	1 person
Free working space (W x D)	583 x 500 mm
Height of guardrail	1100 mm

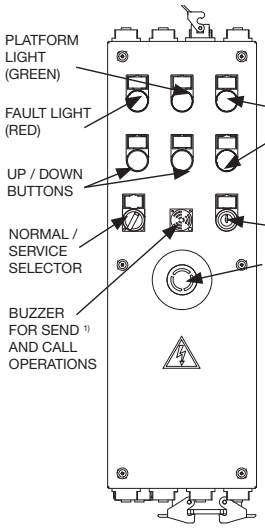
E.3 Dimensions

Space inside the service tool kit is limited to one user only.

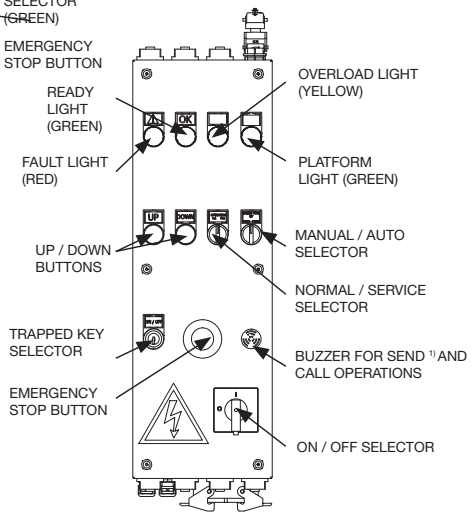
E.4 Cabin control box

When service tool kit is supplied, the cabin control box features a NORMAL/SERVICE selector.

CE cabin control box with service tool kit configuration:



AECO cabin control box with service tool kit configuration:



E.5 Cautions

Only one user on service tool kit is allowed.
During service tool kit travelling, no person is allowed inside the cabin.
During service tool kit travelling, user shall constantly verify that travel zone is free of obstacles.
During service tool kit travelling, user shall be attached to service anchor point at all times.
During service tool kit travelling, user shall use both hands to actuate the two-hand control buttons.
During service tool kit travelling, user shall not extend body parts beyond the service tool kit perimeter.
During service tool kit travelling, no person is allowed at platforms located over it.

CE AECO

[1)] Optional for CE versions and for AECO version.
[2)] Not available for CE versions. Mandatory for AECO version.

E.6 Information signs and documents

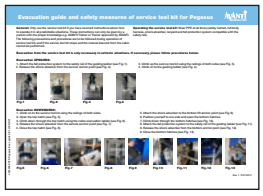
The following information signs and documents are supplied with the service tool kit and shall always be available.

Location	Document
Service tool kit	Standing on top only with service tool kit sticker
	Quick guide of service tool kit
	Electrical hazard warning sticker
	Evacuation guide of service tool kit
	Pull to release sticker [1]

Standing on top only with service tool kit sticker

Service tool kit quick guide

Electrical hazard warning sticker



Evacuation guide of service tool kit

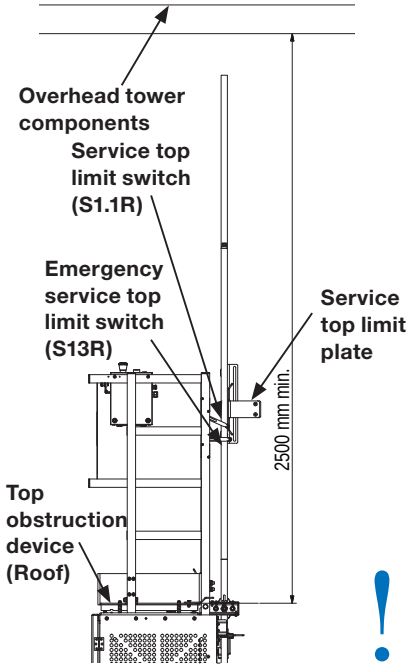
E.7 WTG integration requirements

Special attention shall be given to the integration of the service tool kit in the WTG.

WTG component	General integration requirements
Fences of intermediate and top platforms.	Top surfaces of horizontal railings shall feature non-slip treatment.

E.8 Service top limit plate

The service top limit switches override those ones on the cabin. They are activated by a service top limit plate, which shall be installed on the ladder so that top obstruction device (roof) is at least 2500 mm from overhead tower components when the service lift reaches its maximum top travel.

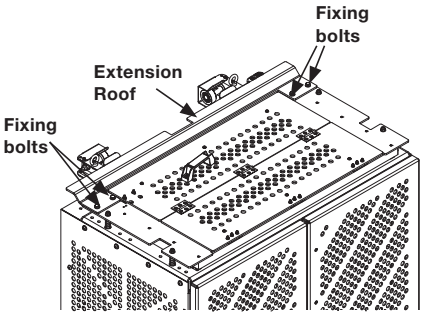

Overhead tower components
Service top limit switch (S1.1R)
Emergency service top limit switch (S13R)
Service top limit plate
2500 mm min.
Top obstruction device (Roof)

Service tool kit shall be mounted on lift at bottom platform.

E.9 Installation

The preassembled set can be entered through the tower door. The service tool kit is installed on the top of the cabin and fastened with bolts through lifting eyes.

1. Remove the extension roof.



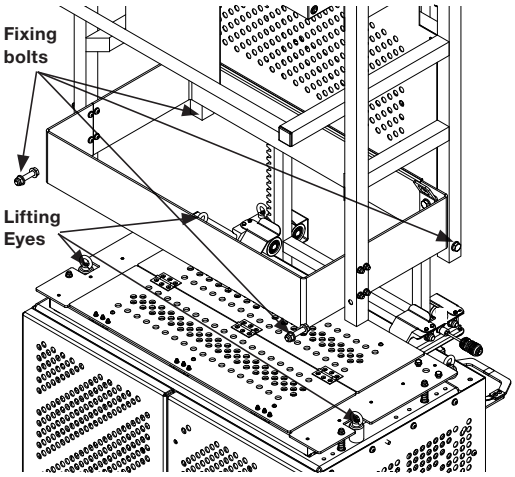
2. Fix the lifting eyes on to the cabin.
3. Position the preassembled structure over the service lift roof.
4. Insert the bolts through the vertical profiles, the three lifting eyes and the reinforment for installation.
5. Tight the bolts with nuts.
6. Connect service control box to the cabin control box.
7. Turn the NORMAL/SERVICE selector of the cabin control box to SERVICE position.

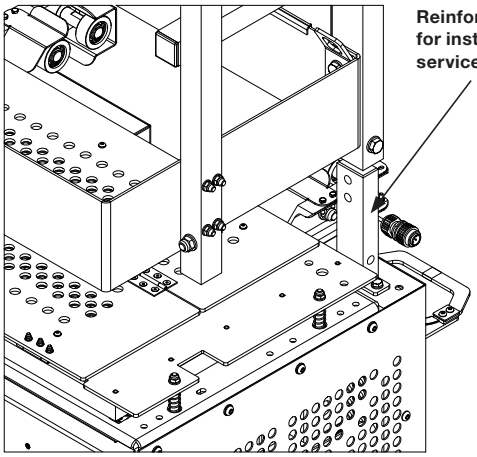
Disassembling is done in reverse order.

After the service tool kit has been disassembled from the service lift, perform an inspection filling in the "Appendix B: Inspection checklist" and the "Appendix C: Inspection log sheet".

After the service tool kit has been disassembled from the service lift, remember to remove the lifting eyes and the reinforcement for installation and to install the extension roof!

[1] Optional for CE versions. Mandatory for AECO version.





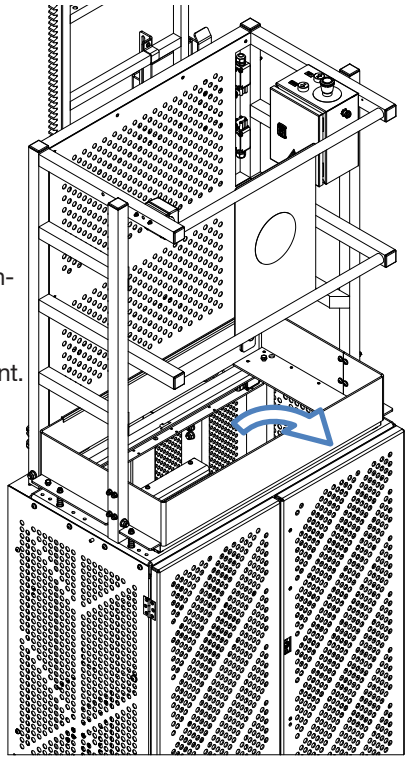
Disassembling is done in reverse order.

When standing on top of cabin, installer shall be attached to safety ladder by means of the fall arrest equipment.

Use a hand winch attachable to the ladder to safely elevate preassembled service tool kit over service lift.

After installation of the service tool kit and before use, an inspection must be performed following the "E.15 Inspection checklist" and results shall be recorded in "Appendix C: Inspection log sheet".

E.10 Instructions for use at bottom platform



To access service tool kit from bottom platform:
1. Level service lift floor with platform floor.
2. Climb up the internal cabin ladder.
3. Open top hatch and climb through it, using the lateral non-slip railings of the service tool kit.
4. Close the top hatch.
5. Hook your fall arrest equipment to the service anchor point.
6. Press and hold the UP and OK buttons simultaneously (two-hand controls) to ascend.

Egress from service tool kit is done in reverse order.

E.11 Instructions for use at intermediate and top platforms

To egress to intermediate and top platforms from service tool kit:

1. Level service lift roof with platform floor.
2. Attach second fall arrest equipment to guiding ladder.
3. Release first fall arrest equipment from service anchor point.
3. Climb over service tool kit fence and overpass platform fence as specified by manufacturer.
4. Release fall arrest equipment from guiding ladder.

To access the service tool kit from intermediate and top platforms:

1. Attach fall arrest equipment to guiding ladder.
2. Overpass platform fence as specified by manufacturer and climb over service tool kit fence.
3. Attach second fall arrest equipment to the service anchor point.
4. Release fall arrest equipment from guiding ladder.

E.12 Safety measures

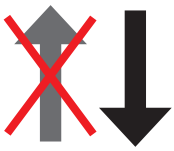
If lift is stopped between platforms with unconscious person on service tool kit:

1. Climb up to the lift.
2. Check that victim has no body parts extending through service tool kit perimeter.
3. Enter the cabin through the bottom hatches.
4. Perform manual descent to the closest platform.
5. Use a hand winch attached to a ladder to elevate the victim over service tool kit and to place him on platform floor.

E.13 Maintenance planning

Frequency	Performed by	Components
Daily	Supervisor	Control and safety devices of service tool kit (only when mounted)
Annually	AVANTI, or qualified personnel authorised by AVANTI	Control and safety devices of service tool kit (only when mounted)

E.14 Troubleshooting

Breakdown	#	Cause	Solution
The service tool kit cannot ascend nor descend.	**A1**	It overrides cabin control box.	Use service control box.
		Service emergency top limit switch (S13r) is activated.	Perform manual descent from inside the cabin until switch is released.
Service tool kit can descend but cannot ascend. 	**B1**	Service top limit switch (S1.1r) is activated.	Descend service tool kit until switch is released.

E.15 Inspection checklist

1	CONTROL & SAFETY DEVICES OF SERVICE TOOL KIT	OK	Not OK	ISSUE DESCRIPTION
1.1	Top limit plate is placed so that top obstruction device (roof) is at least 2500 mm from the overhead tower components when the service lift reaches its maximum top travel.			
1.2	The lifting eyes, the reinforcement for installation and the fixing bolts are properly mounted: so that service tool kit activates the top obstruction device (roof).			
1.3	Turn NORMAL/SERVICE selector of cabin control box to NORMAL position: controls of cabin control box do not function. And controls of service control box do not function.			
1.4	Turn NORMAL/SERVICE selector of cabin control box to SERVICE position: controls of cabin control box do not function. And controls of service control box function.			
1.5	Insert around 40 kg inside the cabin: controls of service control box do not function. Then, remove the 40 kg.			
1.6	Press and hold UP and second hand buttons simultaneously (two-hand controls): ascent is possible (2 m).			
1.7	While triggering service top limit switch (S1.1r), press and hold UP and second hand buttons simultaneously: ascent is not possible.			
1.8	While triggering service top limit switch (S1.1r), press and hold DOWN and second hand buttons simultaneously: descent is possible (1 m).			
1.9	Press and hold DOWN and second hand buttons simultaneously (two-hand controls): descent is possible (1 m).			
2.0	While triggering service emergency top limit switch (S13r), press and hold UP/DOWN and second hand buttons simultaneously: ascent/descent is not possible.			
2.1	Press emergency stop button of service control box, and press and hold UP/DOWN and second hand buttons simultaneously: ascent/descent is not possible.			
2.2	Pull to release emergency stop button, and press and hold UP/DOWN and second hand buttons simultaneously: ascent/descent is possible (0.5 m).			
2.3	All emergency stop buttons function properly.			
2.4	Bottom obstruction switches sit and function properly.			
2.5	Bottom cabin hatch switch sits and functions properly.			
2.6	Bottom obstruction hatch switch sits and functions properly.			
2.7	Top hatch switch sits and functions properly.			
2.8	(If provided) Bottom limit switch sits and functions properly.			
2.9	(If provided) Door switch sits and functions properly.			
2.10	(If provided) Door guard locking switch (S19.3) sits and functions properly.			
2.11	Service anchor point is free of damage and properly installed.			

Appendix F: Test and adjustment of the electromagnetic brakes

The test and adjustment of the electromagnetic brakes shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the steps described below.

1. Readjust the overload limiter to allow to carry 315 kg in the cabin. To do so, follow the instructions of the "Appendix A: Adjustment of the overload limiter" of the manual, but inserting a value of 320 instead of 265.

2. Load the cabin with 315 kg (125% of its rated load).

3. Release one of the 2 motor brakes by actuating its manual descent actuator.

4. While keeping the brake open, press and hold the DOWN button and stop after 3 m. The brake shall stop and hold the lift (the lift shall not slide down).

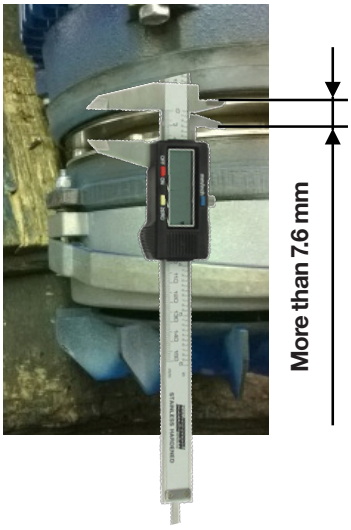
5. If the brake fails to stop and hold the lift, go to point 9.

6. Repeat the test with the second motor brake. If the second brake fails to stop and hold the lift, go to point 9.

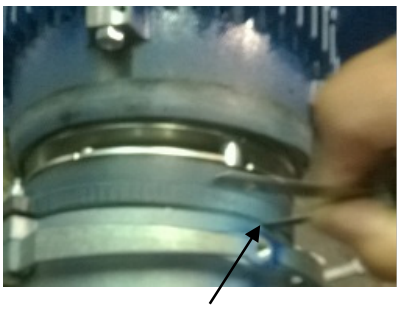
7. Unload the cabin.

8. Readjust the overload limiter to allow to carry 250 kg in the cabin. To do so, follow the instructions of the "Appendix A: Adjustment of the overload limiter" of the manual. The process is finished.

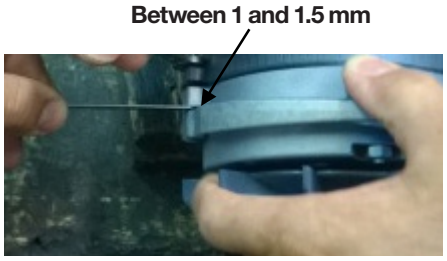
9. Measure the thickness of the brake disc. Replace the brake disc if needed.



10. Measure the gap between the magnetic body and the anchor plate. Adjust the gap if needed.



11.Measure the gap between the magnetic body and the handle. Adjust the gap if needed.

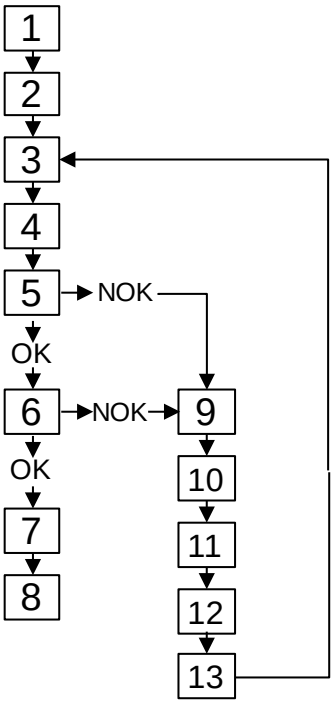


12. Repeat the measurements with the second electromagnetic brake.

13. After replacing or adjusting, repeat the dynamic tests (go to point 3).

The detailed instructions of the adjustment of the electromagnetic brakes are available from AVANTI upon request.

Workflow:



Australia
Avanti Wind Systems PTY LTD
203 Blackburn Rd, MT Waverley, VIC 3149
P: +61 (0) 7 3902 1445 · F: +61 (0)7 3902 1252

China
Avanti Wind Systems
Building 4, No, 518,
Gangde Road, XiaokunshanTown
Songjiang District, 201614 Shanghai
P: +86 21 5785 8811 · F: +86 21 5785 8815

Denmark
Avanti Wind Systems A/S
Rønnevangs Allé 6 · DK-3400 Hillerød
P: +45 4824 9024 · F: +45 4824 9124

Germany
Avanti Wind Systems GmbH
Max-Planck-Str. 10 25335 Elmshorn
P: +49 (0) 41 21-7 88 85 – 0 · F: +49 (0) 41 21- 7 88 85-20

Spain
Avanti Wind Systems SL · Poligono Industrial Centrovia
Calle Los Angeles No 88 nave 1 · 50198 La Muela
P: +34 976 149524 · F: +34 976 149508

UK
Avanti Wind Systems Limited
Caldershaw Business Centre · Unit 29
Ings Lane · Rochdale · OL12 7LQ
P: +44 0 1706 356 442

USA
Avanti Wind Systems, Inc.
5150 S. Towne Drive · New Berlin · Wisconsin 53151
P: +1 (262) 641-9101 · F: +1 (262) 641-9161

India
Avanti Wind Systems India Private Ltd
Old No. 28, New No. 41,
Vellala Street, Aiyanambakkam,
Chennai 600095. Tamil Nadu, India
P: +91 44 6455 5911

Brazil
Avanti Brazil Sistemas Eólicos. S.L.
Rodovia BR-116 · Km21
Fortaleza · Ceará
P: +55 85 9671 6336

I: www.avanti-online.com · E: info@avanti-online.com

45541272 – Pegasus Lift manual, EN
4th CE AECO Edition: 10/2014
Revision 2: 11/11/14